Vol. 1—7

PAVING AND MUNICIPAL ENGINEERING.

A Journal Devoted Specially to Street and Sidewalk Paving, Water Works Construction, Bridge Building, Street Lighting, Sewerage and all Matters Pertaining to Public Improvement in Cities.

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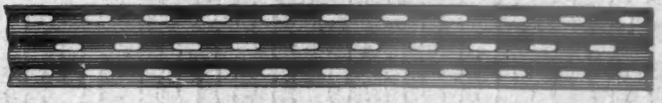

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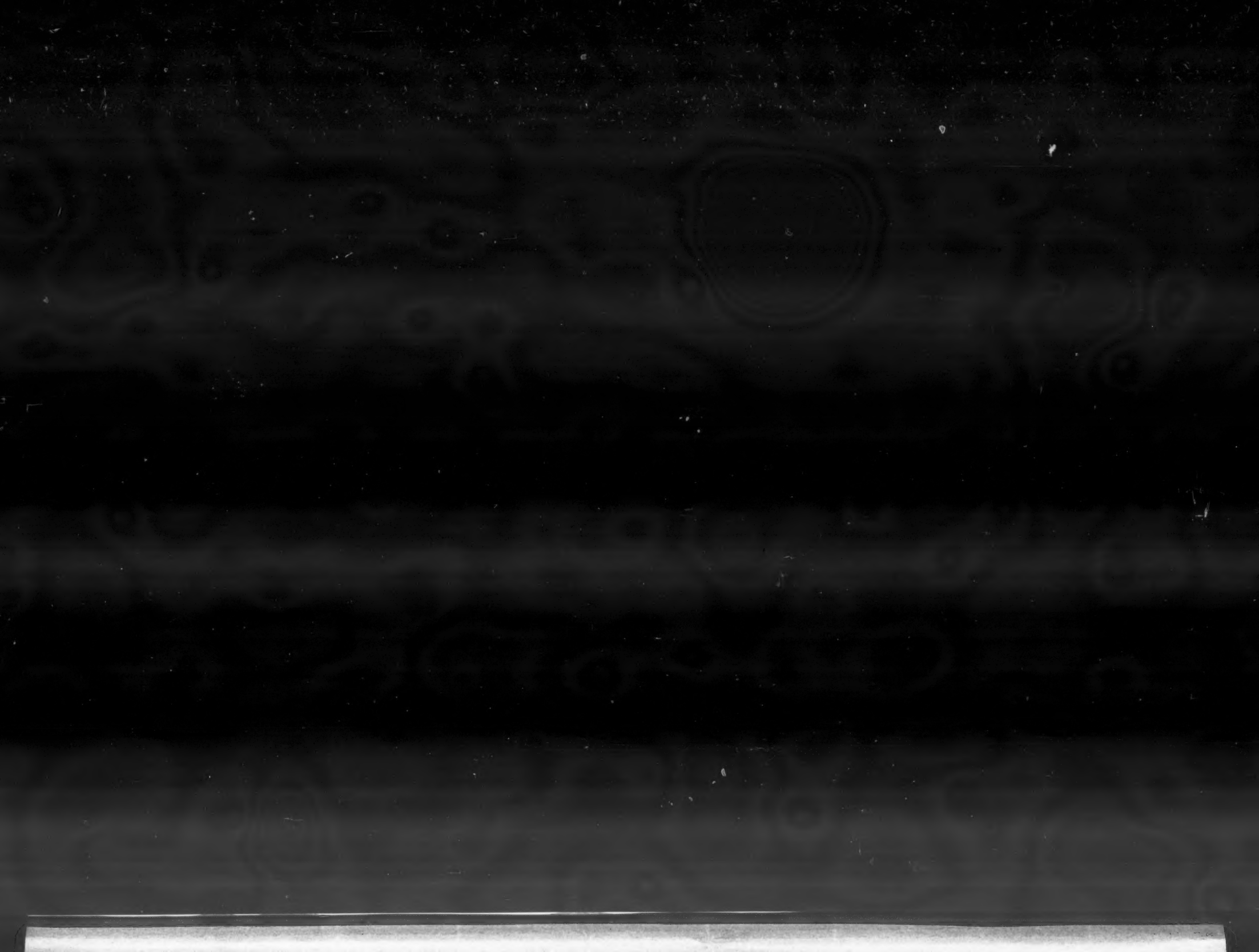

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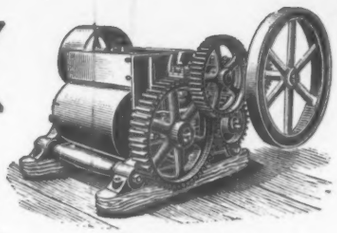

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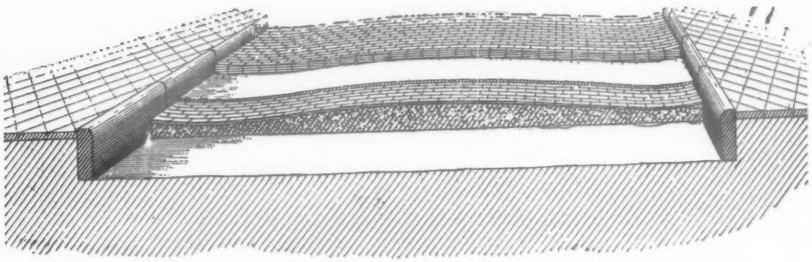

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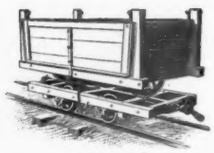

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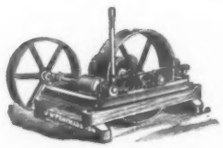

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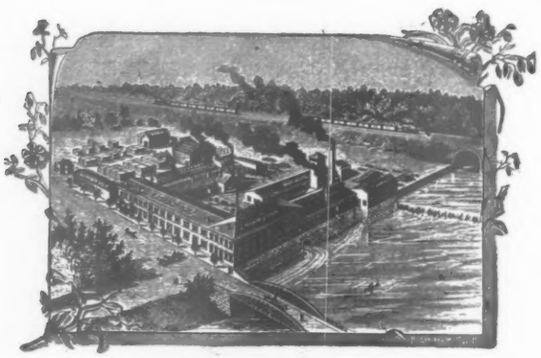

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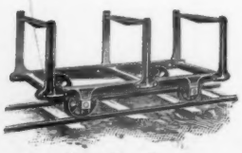

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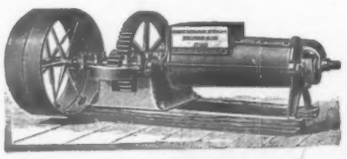

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PAVING AND MUNICIPAL ENGINEERING

VOL. 1. INDIANAPOLIS, IND., DECEMBER, 1890. No. 7.

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SILICA AS A ROAD-MAKING MATERIAL.

By W. L. S. Bayley, C. E.

LIKE gold, this material is improved for mercantile uses by an admixture of strengthening alloys. As gold reduced with copper or other base metals is susceptible of economical uses, which in its original state could not be profitably employed, so silex alone is without character, except such as its purity warrants. It has no cleavage and is comparatively formless, but next to the diamond, its atoms are almost indestructible. The combination in which it assumes its most valued properties is in the following formulas:

1st, Silica	90 %.
Iron	4 %.
Alumina	6 %.
2d, Silica	85 %.
Hornblende	10 %.
Iron and alumina	5 %.

Either of these formulas produces granite-quartzite as shown in the different members of the hard stone family of the northwest.

Let us consider for a moment the combinations which make up the formula for the ordinary granite. A building is being erected in Chicago which will probably cost $800,000, and while the main reliance is upon the steel frame of the structure, certain conditions, notably that of 1871, would leave the granite veneering at the foot of the walls, a mass of debris. An approximate list of the constituents of this stone is:

Feldspar	65 %.
Mica	20 %.
Hornblende	10 %.
Silica	5 %.

It needs no scientific statement to show to the most unlettered how essentially true it is that this is a fair weather stone; if we were to search for favorable conditions wherein this combination could have a reasonable expectancy of life, we should select the banks of the Nile where disintegrating influences are unknown; where stand and have stood for so many ages, the great pyramids illustrating not so much man's scientific knowledge, but nature in her most kindly moods; thus we may say of the old Roman roads. Climatic conditions ruled their permanency. No thoughtful man would, for a moment, assume that those tropical and semi-tropical climes produced the man, method or materials that could excel the road builders, methods or materials of this, at present almost roadless country of ours. The secret of the selection of these scientifically and practically inferior materials, is that granite-quartzite costs $1.10 per cubic foot in the rough and the soft eastern granites flush with feldspar and mica and full of hydroscopic water, with little to commend them except their cheapness, are purchased for 65 and 85 cents per cubic foot; as in these shapes, so in paving blocks and macadam. The eastern granite block, as laid in the streets of our cities, is very soon thereafter an unmitigated nuisance. With the granite-quartzites we have a material 28 % harder than the feldspathic granites and 5 % harder than the Swedish iron of the horse-shoe. This same material as a macadam assures an almost endless service free from dust or mud and sufficiently elastic (a condition incident to macadamization) to insure noiselessness. It only remains for our road builders who use this kind of materials to make the mass impervious to climatic conditions. In conclusion we will say that, as for one, we have found the secret of economically producing this effect.

The material of which we wrote in November's number of our valuable text-book, PAVING AND MUNICIPAL ENGINEERING, has since been proved to be a cement which combines, in an eminent degree, elasticity and indestructibility. Strange as it may appear this quartzite macadam thus bonded, permits an inferior foundation because of the fact that there is no danger from water and frost. The whole roadbed is a drainage sheet and gutters as such are dispensed with, while crowns are flat, making sloughing and whirring conspicuous for their absence.

THE IMPROVEMENT OF ROADS.

By Geo. A. Latimer.

ONE of the most important principles to be observed in laying out or improving a road and one most often violated is in obtaining a level or making the road less steep. If it be not, a large portion of the strength of the horses which travel it will be expended in raising the load up the ascent. If, then, a road rises one foot in every twenty of its length, a horse drawing up a load of one ton is compelled to actually lift one-twentieth of the whole weight, that is one hundred pounds through the whole height, besides overcoming the friction of the load.

If a hill is to be ascended the road up it should nowhere have even the smallest fall, for that would make two hills instead of one, but it should be so located and have such cuttings and fillings as will secure a gradual and uninterrupted ascent the whole way, unless, if the hill be a steep and almost continuous one, it is well to

build level resting places for a load, so that a team of horses will not become weary in the ascent.

There is a popular theory that a gentle undulating road is less fatiguing to horses than one which is perfectly level. It is said that the alternations of ascent, descent and levels, call into play different muscles, allowing some to rest while others are exerted, and thus relieving each in turn. Plausible as this theory appears at first glance, it will be found on examination to be untrue, both mechanically and physiologically, for considering it in the former point of view it is apparent that new ascents are formed which offer resistance not compensated by the descents, and in the latter we find that it is contradicted by the structure of the horse. The question was submitted by Mr. Stevenson to Dr. John Barclay, of "Edenburgh," no less eminent for his knowledge than successful as a teacher of the sciences of comparative anatomy, and he made the following reply: "My acquaintance with the muscles by no means enables me to explain how a horse should be more fatigued by traveling on a road uniformly level than by traveling over a like space upon one that crosses heights and hollows. But it is demonstrably a false idea that muscles can alternately rest and come into motion in cases of this kind. Much is to be ascribed to the prejudice originating with the man continually in quest of variety rather than with the horse who, consulting his own ease, seems quite unconscious of Hogarth's line of beauty. Since this doctrine is thus seen to be mere popular error, it should be utterly rejected, not only because false in itself but still more because it encourages the making of undulating roads, and thus increases the labor and cost of carriage upon them.

There is, however, a limit which ought to be considered in the establishment of a proper grade for a road. It should be so gentle that when a heavy vehicle is descending its gravity shall not overcome its friction so far as to prevent it to press upon the horses.

From experiments made it is to be one in thirty-five (1 in 35) or 151 feet to the mile, which should be the maximum slope upon the best roads. On a slope of this kind a carriage may be driven at the rate of twelve miles per hour with perfect safety and complete control. We would not, however, convey the idea that it is wise to make a road perfectly level, for the reason that proper drainage could not be had. There is at least allowable slope which the road must not fall short of as well as a maximum one which it must not exceed. When a road has a proper slope in its longitudinal direction, not only do the side ditches readily discharge the water that falls into them, but every wheel track which is made becomes a channel to carry off the water.

By eminent English engineers, it has been assured that the longitudinal slopes of a road should be kept, if possible, between 1 in 35 and 1 in 125, never steeper than the former nor nearer a level than the latter.

We have already noticed a road longitudinally and now we will consider its width, shape, foot-paths, ditches, side-slopes, cuttings and fillings, etc.

In forming a roadway it should be the aim to raise the roadbed in the low places and to cut down the hills and in such a proportion as to make the cutting to do the filling without making other excavations than opening the side ditches. To obviate the difficulty which perhaps is most noticeable in railroad grading where cuts are to be made, it is quite necessary that the cut be made sufficiently wide to prevent sliding earth on either side from being washed into the road, and also the cutting should be made wide enough to prevent the center of the road from being made a ditch to carry away the sliding earth. It is also recommended that where deep cuts are to be made in order to preserve the side slopes of deep excavations from being gullied and washed into the road, a ditch should be made along the upper edges of the cutting in order to prevent the surface water of the neighboring lands from reaching it, and upon the slopes themselves should be made ditches called catchwater drains running obliquely downwards to receive the water of rains and conduct it into the gutters. On either side of the roadway a space of six feet of the unbroken sod should be left untouched so as to make footpaths, on the side slopes of which should be a slope of not less than $1\frac{1}{2}$ to 1, and should either be sodded or sown with grass seed, the former way being the more expensive but surer way of preventing the earth from slipping, which will frequently occur if the cutting or filling be of any great depth. Another important feature which should not be overlooked, is proper drainage. The practical application of the word drainage however, is sometimes made much to the detriment of the road, by making cess-pools on either side of the road, or perhaps digging great "canals" to catch the water and then not giving the ditches a proper slope or fall in order to carry the water away. It has been found not necessary to dig large ditches in order to give the road proper drainage, rather to give them a good fall so that the water may be got away with as rapidly as possible. It is very necessary that the roadbed should be made crowning, that is, higher in the middle than at the sides. But if made flat, as is sometimes the custom, it soon becomes worn concave and forms a basin to catch the water, and finally by constant travel forming ruts and unevenness, which will soon destroy the roadbed.

There are many desirable qualities to be had in the surface of a road. It should be as smooth and hard as possible so as to reduce to their smallest possible degree, the resistance of elasticity, collision and friction; smoothness is not only essential to comfort but even more so to economy of labor, of carriage wear and of road wear.

There are many methods, however, of obtaining the proper degree of smoothness in a road or street, but a country roadway, those built on the macadam plan, are cheaper and more substantail than any other as yet used. The plan is to put on the already prepared roadbed from ten to eighteen inches of broken stone or furnace slag, giving them a slight covering of uniform hard gravel; the crevices will be filled and eventually become packed and wear smooth, much sooner than though the stone was left bare. A minimum of expense is of course desirable but the cheapest street is not always the one which has cost the least money, but the one which makes the most profitable returns in proportion to the amount which has been expended upon it. There are, and have been, many pikes built in many of the eastern states, some of which are free, while others are toll roads and have been made to pay quite large dividends after paying all expenses of collecting tolls, keeping in repair, etc., and there seems to be no reason why a system of this kind would not soon be profitable in this country.

It has been argued and has able supporters that the present system of road tax is a false one. The custom of requiring rents to be paid in kind has long since been found to be less easy than money rents. Just so is work paid for by the piece preferable in every respect to compulsory labor by the day.

Men are now taken from their peculiar occupations in which they are skillful and transported to one of which they know nothing. A good plowman does not think himself necessarily competent to forge the coulter of his plow or to put together its wood work. He knows that it is true economy for him to pay a mechanic for his services. But the laws assume him to be a skillful road maker, a more difficult art than plow making, and compel him to act as one though his clumsiness in repairing his plow would injure only himself, while his road blunders are injurious to the whole community. Skill in art is only to be acquired by practical and successful experience, aided by the instruction of those who already possess it, and it has been well and wisely said that an artisan can not be extemporized.

There is another weak feature in the present system of working roads. By having a different supervisor each year and each supervisor an overseer, working the road according to his theory of repairing, some advocating a wide road while others assume a narrow one to be better, and the same with culverts, and consequently, as all observers of highways have seen, the labor of repairing roads is practically lost, when, if a general system of working them and uniformity in culvert and bridge building throughout the country and state were adopted, our common roads and bridges, etc., would be much better.

As a rule, working on the roads is generally made a half holiday

by those who are assembled by the overseer. Few of the men or horses do a half a day's work, the remainder of the time is spent in idleness, and perhaps half the working time being wasted by its misdirection.

Such are the principal defects of the present system of managing the labor expended upon this kind of work. But it is much easier to discover and expose than to remove them. We have almost omitted to mention anything concerning the proper grading of our city streets and alleys, yet the same theory advanced regarding the structure of a country road may be applied to the building of the former, except, as a rule, there should be more of a uniformity of grade of the streets and of the gutters, so that surface water may readily discharge.

SEWAGE DISPOSAL AND HEALTH.

By Geo. Troup Maxwell.

PROFESSOR GUITERAS is authority for the statement that it was the custom of the aborigines of Tropical America to change their residences every eight years. Experience taught those savages the lesson which science explains to civilized man, that when soil, water and air are polluted by organic wastes, the locality becomes deleterious to health. But, what was easily practicable for nomadic savages, is impossible for civilized man. The former did not find it difficult to break camp and move from the accumulated filth of eight years; but it is practically impossible for civilized communities to abandon their costly and permanent edifices. The necessity is, however, equally as great for one as for the other to keep his environment free from disease-producing influences; and whilst the savage accomplished the end by change of residence, civilized man is under the necessity of employing contrivances, often at great cost, for conveying his wastes from proximity to his dwelling.

How to dispose of sewage in the interest of health, is the most difficult problem which is now presented for solution to sanitary art; and, realizing its transcendent importance, there is more thought being bestowed upon the subject by hygienists, than upon any other in the realm of preventive medicine.

A generation and more ago the question seemed to have been definitely and satisfactorily settled with reference to towns and cities bordering upon, or in proximity to, large bodies of, especially running, water; but experience has shown that the expectation of protection by discharging sewage into lakes, bays and rivers, has not been realized; and science affords explanation of the cause of failure.

In a paper on "The Statistics of River Pollution," read before the American Public Health Association, October, 1889, after stating the amount of garbage, night-soil, etc., discharged into the Mississippi, Missouri and Ohio rivers, Dr. Kilvington said: "No theory of self-purification of running water will dwarf this sanitary crime."

In the president's address, delivered at the first annual meeting of the Interstate Sanitary Association, at Wheeling, West Va., February, 1890, Harvey Reed said:

"Ah! but some one says that running water purifies itself. Don't you believe it. The old theory that filthy water becomes pure by running over a half-dozen pebbles has long since been proven false, and without foundation."

London, after long trial, abandoned it. "Owing to the serious nuisance caused by the pollution of the Thames by the sewage of London, the royal commission on metropolitan sewage discharge was appointed, and issued two important reports in 1884. They came to the conclusion that the sewage of the metropolis must not be discharged in its crude state into any part of the Thames. It may be said, in general terms, that sewage should at least be delivered where the tide has a free sweep, or should be delivered only on the outgoing tide, and at a point whence a serious reflux movement is not to be apprehended. This was the theory of the discharge of the sewage of London into the Thames. At a point some miles down the river, great reservoirs were built to retain the flow during the incoming tide, the accumulation being discharged with the ebb. These works were enormously costly, were well planned and well constructed. The plan was probably accepted at the time (twenty years ago) by all competent engineers as being a safe one. The result has been an almost absolute failure, and renewed efforts are now to be made to get rid of the huge nuisance, with which Bazalgette's appliances were not sufficient to cope. The incoming tide insists on returning, often to a point miles above the tidal outlet, matters which it was promised should work their way seaward, and never be heard from more." (Waring.)

Boston, with her salt-water bay, and strong 9.9 feet mean tide, tried it, and, after signal failure, abandoned it. "The sewers of Boston formerly discharged at the foot of every street, or at the back of the house lots. Boston was practically surrounded by a deposit of sewage filth, some of it stranded and stationary, and some moving back and forth with the changes of the tide and wind."

A deep main sewer has now been constructed which intercepts the old system, and removes the sewage by which the shore was formally fouled. This sewage is delivered at a pumping station remote from the city, and is, by mechanical power, delivered to Moon Island, well down the harbor. It is here ponded until the proper point of the ebb tide, when gates are opened and the accumulations are carried seaward—the gates being closed before the turn of the tide.

Chicago and Cleveland tried it, but the waters of Lakes Michigan and Erie are not sufficient to dilute the sewage of those cities to the point of innocuousness; and now Chicago has appropriated $60,000.000 to abate the nuisance.

Jacksonville is trying it, but the foul condition of the wharves, and of both littorals of the majestic St. Johns, above the outlets, have put the stamp of failure upon her experiment.

There was a time when it was believed that the destruction of organic matter was effected by a chemical process, known as oxidation; but that notion has long since been exploded. It is now known that the destruction of organic matters is due to the action of bacteria (germs). It was established by Pasteur, in 1862, "that putrefaction is identical with the life of the concomitant organisms." It is the experience of all bacteriologists that sterilized culture-media can be preserved indefinitely, though exposed to air, if bacteria are excluded.

The process of embalming affords a familiar demonstration of the falsity of the theory of putrefaction by oxidation. An embalmed body is preserved indefinitely though exposed to the air. The explanation is that embalming fluids hold in solution powerful germicides. Putrefaction does not take place because an embalmed body, saturated with germicides, is fatal to the putrefaction germs. The submergence in water retards and hinders the putrefaction of organic matter. There are few who do not know that timber is preserved by being placed under water. The explanation of the protection which water gives is that the putrefaction germ—bacterium termo—is ærotic, that is, it is, so to speak, an air-breathing plant, which dies when submerged. It is that scientific fact which furnishes a strong reason why sewage should not be discharged into water-courses. The organic matters of sewage are so protected from putrefaction by water, that they remained to be carried by tides and winds till lodged in the crevices of wharves and upon the shores. When so deposited, as the water subsides putrefaction takes place and the foul odor becomes a nuisance. Residents of Brooklyn, near the river, have at times had very decided but far from pleasing consciousness of this fact.

NEW WATER-WORKS FOR MOSCOW.

Nicholas Wertheim, Vice-Consul of United States.

TO most Americans it will be utterly inconceivable how, within the present age, a populous city like Moscow, having close upon 800,000 inhabitants, could possibly have so long endured so great a privation as the scarcity of water; yet there is the fact that this town has managed to jog along for the last fifty years and still exists upon the scanty supply of barely 1,500,000 gallons of water per diem.

However, after a course of deliberation extending over a number of years, this vital question of providing the town with more

water has at last been brought to a head. The municipality has issued a loan of about $3,000,000, bearing five per cent. interest, for the purpose of constructing a new system water-works.

Before entering any further upon the subject of reconstruction and extension of the existing old water-works of this city it may be of some interest to trace its history and origin.

During the reign of Empress Catharine II, somewhere about the year 1779, the city of Moscow depended entirely upon carriers for her water supply, brought from the outlying districts of the town; it is said to have been so bad that the Empress used to have hers brought for her all the way from St. Petersburg.

On one of Her Majesty's annual pilgrimages to the monastery of St. Sergievo, overcome with the heat and fatigue of her self-imposed pedestrianism, she halted at Metistshe, a small village about seven miles northeast of Moscow, and having quenched her thirst with some water obtained on the spot, Her Majesty was so delighted with its purity and freshness that there and then she decided to utilize the source that had so unexpectedly been brought under her notice for Moscow.

In June, 1779, an engineer named Bauer was commissioned to design a plan for conveying the water to the town, but his conduits of stone could not resist the effect of frost, and the work was abandoned.

In the year 1820 another engineer projected a plan to supply the town with water from the river Moskva; but he, too, failed, and took his own life in sheer desperation.

It was not before the close of 1834 that the existing water-works were executed by Baron Dervig, and the idea of the Empress, of supplying her cherished old city with water from the springs of Metistshe, was successfully carried out.

The water, obtained from a series of springs at Metistshe, is all that can be desired, and there is plenty of it.

The fresh supply is to be obtained by sinking a number of wells of small diameter, known as the Brooklyn system, and conveyed by a 24 inch main to an intermediate pumping station, and thence to a water-tower in the town, and distributed into a tubing of from four to eight inches diameter and a length of about 90 miles, representing a weight of about 16,000 tons of metal. The supply is now to be increased from 1,500,000 to 4,500,000 gallons per diem.

MAINTENANCE OF ROADS.

THE Roads Improvement Association of England has issued a pamphlet on "The Repair and Maintenance of Roads," by Mr. W. H. Wheeler, M. Inst., C. E., from which the following useful information is taken:

Good Roads Economical.—For economical and convenient traction, roads should be maintained in thoroughly good order. This, however, is seldom the case. Turnpike roads, which at one time were maintained in efficient condition, since they have been handed over to the parish authorities, have been allowed to deteriorate to the condition of ordinary highways; and many roads are kept in such a condition as to be a disgrace. This is the more inexcusable as it is a fact, well known to all who have had experience in the matter, that roads well maintained and kept in good order cost less than bad roads. So long ago as 1819, a select committee of the House of Commons gave expression to the following opinion as the result of the evidence placed before them: "The most improved system is demonstrated to be the most economical; and even the first effectual repair of a bad road may be accomplished with little, if any, increase of expenditure, and its future preservation in good order will, under judicious management, be attended with considerable saving to the public." The author can bear practical testimony to the fact that not only do roads kept in good order cost less to maintain than roads badly repaired, but that also a direct benefit arises to the persons using them from the greater loads which horses can draw.

Management.—Under the provisions of the last highway act, the payment of one-half the cost of the main roads out of the county rate, and one-fourth out of the government taxes, on condition that the roads are maintained in a condition satisfactory to the county surveyor, has acted as a check on the highway authorities. Where the county supervisor has done his duty by strictly refusing the grant where the roads were not efficiently maintained, the parishes have found it to their advantage to employ more competent surveyors and to have good roads. By the local government act of 1888, power is given to the county councils to take into their own hands the management of the main roads. This plan ought to lead to economy and greater efficiency. The placing of the main roads under the control and management of the county surveyor will insure the supervision of a skilled officer and a more efficient system of management.

Width of Wheels.—The following proportions have been recommended: ½ to ¾ ton on each wheel, tire 3 inches wide if without springs, 1 inch with springs ¾ to 1 ton, 4 or 3 inches; 1 to 1½ tons, 6 or 4 inches. A clause proposed to be inserted in any new highway act that may be passed requires that all carts weighing over 672 lbs. should have wheels of not less than 4 inches in width and vehicles drawn by more than three horses should have wheels of not less than 6 inches in width. Wheels of a large diameter do less harm to a road than small ones. Stones will be pushed and moved out of place by the small fore wheels of a wagon, while the larger hind wheels will pass over without displacing them. Large and broad wheels not only do less harm to the roads, but cause less draught for the horses.

The Condition of a Good Road.—A perfectly good road should have a firm, dry foundation, good drainage, a hard and compact surface free from ruts, hollows or depressions. The surface neither too flat to allow water to stand, nor too convex to be inconvenient to the traffic; free from loose stones, the fresh material being put on whenever practicable in winter, in such a manner as to inconvenience the traffic as little as possible. All mud to be scraped off the surface at once and not left in heaps on the road. A grade of 1 in 40 (2.5 per cent.) may be considered as safe for a horse to trot down with a light vehicle, and this should be the limiting grade. In hilly districts it is not possible to keep the grades down to this, but there exist numerous cases where, by taking off the crest of a hill and filling a hollow, dangerous portions of roads might be improved at a comparatively small expenditure. A grade of 1 in 20 (5 per cent.) is too steep for convenient traction and should never be exceeded. Where railways alter roads for bridges or other purposes, the grade must not exceed 1 in 30 (3.3 per cent.) for a turnpike road, or 1 in 20 (5 per cent.) for any other public carriage road. On a good paved road a tractive force of 33 lbs. is required to move a ton; on a well constructed and maintained macadamized road, 46 lbs.; on an ordinary country road, fairly well kept, 65 lbs.; on a badly kept road, with loose surface, the force may be double or treble the last figure.

Formation of New Roads.—Telford's plan was to lay a solid pavement of large stones, on this a layer of stones carefully broken to pass through a 2½ inch ring guage, no stone weighing more than 6 ounces, and on top of this gravel or other fine material to bind the stones. Great attention was paid to the surface until it became thoroughly solidified, and then it stood for several years with very little repair. Macadam substituted for the first coat of rough pitching a layer of hard stones broken into angular fragments. As ruts or irregularities formed they were raked and leveled, and fresh material added until a hard and level surface was obtained. Granite, greenstone, or basalt was preferred. The great art in road making is to so construct the surface that wet can not penetrate from the top and dirt can not work up from the bottom. The use of refuse from ash yards is to be condemned. Chalk is easily affected by frost, unless covered with a thick coating of hard material. Burnt clay is dry and porous, and if well burnt and thickly covered makes a good material.

Improvement of Existing Roads.—The mud on the surface must be regularly removed, all hollows and flat places filled with well broken, hard, angular material, aud this process continued until the surface becomes level. If new material is required in summer, it should be very small, and be covered with road scrapings

in order to get it bedded. Granite chippings are a useful material for patching in summer. As soon as the wet weather in autumn commences, the wheel tracks and hollow spaces, caused by the horses' feet, should be filled in with stone, put on with a shovel from a wheelbarrow; as fresh tracks are made, fresh material should be put on, and this is continued up to the end of December or the middle of January.

Best Form of Road.—Roads that are too flat hold the water and keep the surface wet. Roads that are too round are inconvenient for traffic and wear badly, owing to the sidewise slipping of the wheels and the tendency of the traffic to keep in one track along the middle of the road. The best form for the transverse section of a road is that of an ellipse, the surface having a small inclination in the middle, and a steeper fall at the sides towards the gutter. A total fall from the center to the sides of $\frac{1}{2}$ to $\frac{3}{4}$ inch per foot will be sufficient on a road repaired with good hard material. Where soft, inferior material is used a greater inclination must be given.

Repair of Urban Roads.—Where there is much traffic it is impossible to prevent macadamized roads from wearing into dust in summer and mud in winter. In repairing the wear with broken stone some substance must be used that will enable the stones to bind together and form an even surface. The filling material will cause dust and mud; but if not used, the stones themselves will be ground down to fill the interstices. Some road surveyors have adopted the plan of mixing the filling-in material with tar before it is placed on the coating of stone. A road treated in this way, if well rolled before being used, has a surface almost impervious to rain, and, owing to its elasticity, of a very enduring character. Granite chips or the screenings of broken slag are excellent material for mixing with the tar. The heap of material, after mixing, should be allowed to remain for several days before use, otherwise it will be too sticky. The material used in repairing is the hardest and toughest to be procured, broken to an even and regular size, the fragments not larger than will pass through a 2-inch ring. The surface is covered with sharp material of the same character as the stone, ground to chips in a stone breaker. The surface is then well watered and rolled with a steam roller weighing not more than ten tons. A greater weight is apt to damage the gas and water pipes. Horse rollers, if sufficiently heavy, require several horses, and the tread of their hoofs has a tendency to loosen the stones and leave indents which the roller does not level. The universal testimony of surveyors who have used steam rollers is that, while making good roads, they are economical.

Repair of Country Roads.—This is a much easier task than the repair of town roads. The main points to be observed are: Constant care on the part of the roadman never to let his road get out of order; use of good material; proper attention to surface drainage; cleaning the mud off in wet weather; removing all loose dry stones in dry weather. Roads should be divided into lengths, and a certain length alloted to each man; the same man should be kept on the same portion of the road. On an ordinary main road, where good materials are used, an active man can keep from three to four miles of road in repair, with occasional help in winter to assist in putting material on. The men should be carefully selected, and should be employed all the year round. There is always plenty of work in keeping the roads clean and free from loose stones; in cutting weeds, and cleaning out water tables and drains. In dry weather by removing the dust there will be less mud to scrape off in winter. In showery weather, by filling up the low places with small stones the road is kept level and in better condition to withstand the bad weather in the ensuing winter. The practice of employing incapable old men at small wages is far from economical, and can not be too strongly condemned. The object of the roadman should be to so manage his road that ruts are never formed; the surface should be kept level so that the water may quickly pass off. This can only be done by constant vigilance and by changing the line of traffic.

Where three ruts have been formed, one rut only should be filled at a time, so that traffic will be diverted, the wheels of some vehicles going on one side and those of others on the other side of the new material. It is best first to fill up the track made by the horses' feet, as the horses will then of themselves avoid walking on the new material. By judiciously putting the stone on in small quantities at a time, first on one part of the road and then on another, the surface is kept level and hard, the wet gets off easily, and there is less tendency for ruts to form.

Mud should be regularly removed, as in winter it prevents the sun and wind from drying the road, and in summer causes clouds of dust. No road surface can be kept hard, nor can ruts be prevented, where mud is allowed to accumulate and remain on the road. The summer dust makes winter mud; and it requires much less labor to remove dust than to remove mud. Bass brushes do not displace the material as much as scrapers, and more effectually clean and dry the road. For macadamized roads where there is much traffic, a horse sweeping machine is a most effectual instrument.

Loose stones should be picked off in summer time, as they are inconvenient and dangerous to horses and cyclists. The roadman on rural roads should regularly and frequently go over his road with a basket and remove any loose stones lying on the surface. If material put on, to fill up hollow places in wet weather, does not become bonded by the time dry weather sets in, the material should be removed and wheeled back to the stone heap.

Surface Drainage.—At the sides of all roads maintained in good order, a gutter or water table is formed, with an edge cut in the grass like that of a garden path, openings being left at intervals to let the water get away to the ditches. This edging defines the metalled surface of the road, and affords the means of rapidly discharging the rain falling on the surface. The edging should not be so high as to prevent the passage of wheels over it in an emergency, and should therefore not exceed, except where there is a regular foo'path, 3 to 4 ins. in height. The formation with a proper water table is better for the road than the removal of the grass sides and the continuance of the tranverse slope of the road to the ditch, a practice sometimes carried out with the view of affording drainage.

If this grass is removed, the sides of the road become poached by cattle trampling in wet weather, and are generally dirty and wet, while the dirt is carried onto the road by the feet of sheep and cattle. The grass sides afford an abutment to the metalled part of the road, and the edging prevents the stones from being kicked into the ditches. The sides should be regularly cleaned of the mud and dirt washed down by the rain, and the water tables should be cleaned out in the autumn before the wet weather sets in. The number and position of the cross outlets to the ditches can best be determined in wet weather, the lowest places being then easily seen by the standing of the water. When the edge forms a footpath, the outlets must be provided for by pipes passing under the path.

Material.—The chief requisites for a material for repairing roads are, that it should be not only hard, but tough, and not easily affected by the weather. The fragments should be angular and cubical, so as to bind well together; each stone should fit against and be wedged compactly up to its neighbors, as in a piece of mosaic work, and no space left for water to penetrate. It is more economical to use good material, even if it has to be brought from a distance, than inferior local stone at less cost. No material is so efficient and really economical as granite, or some of the hard volcanic rocks. There is less labor and carting in putting a durable and lasting material onto roads than one that is more perishable and requires frequent renewing. Some of the harder limestones and sandstones make fairly good roads; but the former especially, although hard and tough, becomes disintegrated rapidly by frost, and both wear into dust and mud. The softer kinds of limestone are unfitted for good roads; they are soon ground into dust, which forms a sticky mud. Broken slag, which is much used, is cheap; but it is brittle, makes a slimy mud, and from its want of toughness it does not make a good wearing surface. Flint gravel makes a clean road, and if properly attended to gives a firm surface. Sea shingle, and gravel consisting of rounded pebbles, although clean and hard,

never consolidate. Round gravel is one of the worst and most dangerous materials. If the gravel becomes consolidated in the winter it is certain to work loose in the following summer; as the constant tendency of all stones having rounded surfaces is to roll around each other, and so work loose. The materials to be avoided are those that wear quickly and that work loose.

The stones should be of uniform size, and the hard and tough rocks should be broken into smaller fragments than those that are softer. Where granite or hard material has not long been used, the size to pass through a 2-inch gauge is not too large; after granite has been used for some time and the road has been fairly well coated with it, so as to give a good resisting surface, a size to pass through a 1¾-inch gauge is sufficient. A smaller size will not stand the crushing of the wheels, and soon becomes dust.

Stone should be carted and placed in heaps during the summer, to be ready when wanted; all stones harden by exposure to the weather, so that stones so placed will wear better than if hauled direct from the quarry. If possible the stone should be placed at the side of the road in heaps of a cartload each, and wheeled onto the ground in barrows. With stone placed direct from the cart, it should be shoveled, and not shot directly out of the cart. In repairing, the stone should be laid in the early part of the winter, to allow of its being thoroughly bedded and incorporated with the old material. If necessary to put stone on at other times, the surface should be loosened with a pick, the stone evenly spread and covered with clean road scrapings. For repairs of this kind only the smallest kind of material, such as granite chips, should be used.

Cost of Repairing Roads.—The cost must necessarily vary with the amount of traffic and the ease with which materials can be supplied. The average of the turnpikes and main roads in England and Wales, for manual labor, materials, carting, tradesmens' bills and salaries, for the years 1881-82-83, was $168.15 per mile, and for ordinary highways, $59.30. The great difference between the two is accounted for partly by the fact that on many highways there is no traffic except that due to the use of the roads by persons living in the locality, but chiefly because under the head of highways are included many miles of roads which are little else than green lanes, only used in the tillage of the fields to which they give access. It may be taken as a fair estimate for the main roads, excluding the strictly urban portions, that a mile of road will require forty tons of granite to repair it, and that one man can keep in order four miles of road. Putting the granite at $2.50 per ton, and the wages at 62½ cents per day, this, with an allowance for carting, extra labor and incidental expenses, would give about $175 per mile per year. After a road has been thoroughly well coated with granite, the quantity of material required will decrease considerably. On the other hand, roads which have previously been repaired with soft and inferior material require a larger quantity of material and more labor.

GRADES AND HAULAGE.

By Andrew Rosewater and Frank Chrysler, C. E.

TAKING the theoretical pulling force into account, exclusive of all other considerations, an average horse weighing 1,200 pounds can just draw on a four-wheeled vehicle, the wheels moving upon iron rails on a level grade, a load inclusive of the weight of the wagon, of 60,000 pounds; 40,000 pounds on a level over an asphaltum pavement; 24,000 pounds on a level over a brick pavement; from 10,000 to 18,000 pounds on a level over stone blocks, according to the material and character of the joints; 15,000 pounds on a level over a plank road; or 7,500 to 12,000 pounds on a level over macadam, according to finish; 9,000 pounds on a level over a cobble-stone pavement; 6,000 pounds on a level over a good earth road; 3,600 pounds on a level over a sandy road. These loads are the maximum loads, and could be hauled for a small period of time over short distances. One-third of the amounts named represents the actual load an average horse can draw on a level for ten hours a day at an average speed of 2½ miles per hour; in other words an average horse can haul ⅓ of the loads named, 25 miles daily. These exhibits are often erroneously made to show the comparative merit of paving materials, and it is singular that the most recent standard publications, taking these facts as a basis, give as a standard for further computation of haulage, the general statement:

"Calling the load a horse will pull on a level, as 100, then on a grade of

1	per	100	he	can	pull	90,
2	"	"	"	"	"	81,
$2\frac{27}{100}$	"	"	"	"	"	75,
$1\frac{1}{2}$	"	"	"	"	"	72,
$3\frac{1}{8}$	"	"	"	"	"	64,
$3\frac{84}{100}$	"	"	"	"	"	55,
$4\frac{16}{100}$	"	"	"	"	"	50,
5	"	"	"	"	"	40,
10	"	"	"	"	"	25."

If these figures as to haulage on different grades were true, then the problem of selection of pavements would be of easy solution, but a careful computation of loads a horse can actually move upon different inclinations, shows that this table is incorrect in every instance, and the rates of haulage upon different grades differs materially with each kind of pavement. Thus calling the load 100 that can be hauled over an asphaltum pavement on a level, then on a grade of

1	per	100	the	load	will	be	41,
2	"	"	"	"	"	"	25,
3	"	"	"	"	"	"	18,
4	"	"	"	"	"	"	13,
5	"	"	"	"	"	"	10,
10	"	"	"	"	"	"	4.

This presumes that the footing would be sufficient at all times,—in fact, a 5 per cent. grade is about the limit of safety for a horse to travel over an asphaltum surface.

Similar computations show that taking an earth road, and calling the load a horse can haul on a level, 100, then he can haul over its surface upon a grade of

1	per	100	a load of	80,
2	"	"	"	66,
3	"	"	"	55,
4	"	"	"	47,
5	"	"	"	40,
10	"	"	"	20,
15	"	"	"	10,
20	"	"	"	4,

and at 25 per 100 he can just go up without a load.

Upon the same basis of computation, taking a common stone pavement over which a horse can just haul 10,000 pounds upon a level, he will haul over various inclinations as follows:

1	per	100,	72	per cent.	of	the	original load.
2	"	100,	55	"	"	"	"
3	"	100,	44	"	"	"	"
4	"	100,	36	"	"	"	"
5	"	100,	30	"	"	"	"
10	"	100,	14	"	"	"	"
15	"	100,	7	"	"	"	"
20	"	100,	3	"	"	"	"

These exhibits show clearly that the problem of an economical system of grades and appropriate material for paving in any locality requires the mature consideration of experienced engineers for its proper solution. The appropriate grade, with due regard to drainage and traffic, the nature of the material, with reference to its first cost, wear and tear, healthfulness, resistance to traction, all must be carefully considered before a proper decision can be arrived at.

ELECTRIC STREET RAILROADS.

ACCORDING to figures compiled recently there are now nearly 9,000 miles of street car track in this country and Canada. The figures furnished by the *Street Railway Journal*, in response to an inquiry, are as follows, being derived from the latest returns received from street railway companies:

Miles of Horse railroad	5,902
" " Electric "	1,753
" " Dummy "	556
" " Cable "	441
Total mileage	8,652

There are now in operation 44 cable roads and 264 electric roads. The total number of street railroads is about 1,000, so that the lines operated by electricity include about 25 per cent. of the roads and about 20 per cent. of the total mileage. This is an excellent showing for the comparatively short time that electricity has been in use on railroads.

It is no wonder that the problems of street railroad work are so attractive to electrical inventors and electrical engineers. They begin to realize the magnitude of the field, its possibilities, and the fact that it is theirs in a peculiar and special way. It is also a good training school for the heavier work that awaits beyond in operating many of the present steam railroads.

The work of the street railroads in the urban transportation of our people is enormous. In St. Louis it has been found that the whole population is carried 110 times a year by the street cars. In the State of New York the surface street railroads, 91 in number, carried 368,496,648 passengers during the year ending September, 1889, or the whole population of the State 50 or 60 times. If we added the 217,000,000 of the elevated roads, it would make the population of the whole Empire State ride not less than 80 or 90 times a year in the street cars. Probably such high ratios do not apply over the whole country, but the figures are still very striking, even if minimized. There are slightly over 29,000 street cars, open and closed, in America. If, say 18,000 of these are in daily commission and carry no more than 200 passengers each, the total number of passengers is not less than 1,314,000 000 per annum. This would give every inhabitant of the United States about 20 car rides a year.

Evidently street railroad work is rapidly assuming gigantic proportions, and as it grows it opens up a larger and larger area for electrical engineering and electrical productions.—*Electrical Engineer.*

FOUNDATIONS FOR WOOD BLOCK PAVEMENTS.

MR. JAMES G. McBEAN, president of the Garden City Paving and Post Company, in a recent interview in the Chicago *Post*, said that the wood block pavements in that city were not properly put down, owing to faulty requirements of municipal ordinances. He says that wood block pavements can be put down on a guarantee that they will be kept in perfect condition for ten years if put on the proper foundation. He explains his idea of what the foundation should be as follows:

"If I had my way and were doing it on a guarantee for ten years, I would have a bed of six-inch broken stone, on which I would place a three-inch cushion of coarse sand. I would mass this either by rolling or washing, or both. On this would come directly the cedar blocks. I would make them seven inches deep instead of six, as at present, and I would have them no smaller than five inches, nor larger than seven inches, instead of from four to eight inches—four inches is too small, and very few blocks are eight inches any way, and there is no virtue in their being that large. The interstices between the blocks would be filled with coarse sand, and over the whole and in all the cracks would come a good thick layer of coal tar composition. Now, that is cedar block pavement as it should be laid. I laid the first cedar block pavement ever laid in Chicago, in 1875, and from that day to this I have not been allowed to lay it as it ought to be. Why? Because of the peculiar framing of the ordinances. Somebody always has an ax to grind of his own. I am not blaming the department of public works or the street department—they have nothing to do with that. It is only their duty to see that the ordinances are lived up to after they are passed.

"There is still another way to lay wood blocks, but the whole scheme is modified. In the way I have outlined you will observe the foundation is perfectly porous. If it were impervious a little water would get in at some time to the blocks from above, but could not get out through the bottom; it would go to the impervious bed, lie there until the hot sun struck it, when it would come up again in the form of vapor—then the blocks would soften and finally rot. Now the second way to lay cedar blocks involves the laying of them when they are perfectly dry and the sealing of them from the air and moisture by a concrete, impervious foundation and a very heavy coating of coal tar composition on top. This last is a little more costly method and equally as good as the other."

STREET PAVING IN LONDON.

WALTER H. COOTS, a member of the Detroit Board of Aldermen, in a recent article in the Detroit Free Press, gave the following observations regarding paving in London:

Every street in the city is well paved, either with wood, asphalt, granite or macadam. A large percentage is macadam. The foundation for all paving except macadam is concrete.

In preparing the foundation the engineer drives stakes across the street, showing the true crown. On top of the stakes they nail slats one-quarter of an inch thick. The concrete is then shoveled in until flush with the stakes. A 3-ft. straight edge is then used on the slat, which is then raised up or hammered down until the slat forms the true grade or crown of the street. This is done every 16 ft. The spaces between are filled with concrete until about flush with the slats, and tamped with shovels as fast as filled in. Then fine sand and cement is placed on top. It is then struck to the true grade and crown by drawing a 17-ft. straight-edge over, keeping the ends of the straight-edge on the slats. The concrete thus completed is almost as smooth as a hard plastered wall. After the concrete is thoroughly set, the slats are removed, and the space plastered over with cement.

The blocks used for wood paving are Norway pine, free from sap or rotten knots, sawed with fine saws, 9 ins. long, 6 ins. wide and 3 ins. thick. A block that is one-eighth of an inch more or less is rejected. The two courses next to the curb are laid parallel to the curb and from 1½ ins. to 2½ ins. from the line of the curb. The space between the curb and the blocks is filled with fine sand without being tamped, which they claim serves the purpose of a cushion and allows for the expansion of the blocks. If this was not done they claim the heat and rain would cause the paving to bulge up in the center.

In paving a street the blocks are laid across the street ¼ in. apart, with a slat ¼ in. wide between. The latter is removed when the course is completed. The city inspector watches every course that is laid and removes every defective block that comes under his eye, replacing it himself with a sound block. As they progress they wheel on, in wheelbarrows, cement and sand, properly mixed. The pavement is then watered, the cement and sand sprinkled and, with whalebone brooms, swept over until the interstices are completely filled. Two men with iron implements are kept busy keeping the blocks at proper distances apart and in true courses. If, after slushing, the courses are not true they are taken up and relaid. When the work is satisfactory to the proper officer of the Board of Works, one-half inch of very fine shingle is spread over the surface, and the pavement is ready for traffic.

For granite block pavement, on top of the concrete is placed from 1½ to 2 ins. of very fine shingle. Blocks from 8 to 10 ins. long, 8 ins. wide and 3 ins. thick, are laid in true courses across the street, breaking joints from 2½ to 3 ins. Their method of laying granite blocks is different from ours, and gives better results. Three courses of blocks are laid every 16 ft. on the street to be paved, then the spaces between are brought to a true crown and graded by means of a 17-ft. level. Then, as in wood paving, fine screened gravel and cement is "slushed" over, filling all joints and spaces. A top dressing of fine shingle is then sprinkled over the pavement and it is ready for use.

I watched the repaving of Regent street with yellow pine from the Baltic. The old paving had been down eight years, and had worn down in the center to a thickness of three inches, and was still what we would consider a good pavement, being smooth and free from holes. There was no perceptible rot in the old blocks.

The specimen which I brought home with me is about an average. The contract price for paving is seven shillings, or $1.75 a square yard, the contractor removing old paving and repairing foundation when necessary.

I saw them repave King William street with asphalt. The old paving was the same, and had been down twelve years, and was then in a good and fair condition, but had worn thin. The asphalt used in London is what is known as the Val de Travers rock asphalt, and is brought from the mines of that name at Neufchatel, Switzerland. No other kind is used to any extent. Trinidad is not laid in London at all.

London sidewalks are all in first-class condition, and are the same as the streets repaired by the city, when needed. Such a thing as notifying or waiting for a property owner to repair the sidewalk in front of his property is unknown in London. When a street is paved new sidewalks are laid on both sides, and the expense is included in the paving assessment.

The tramways in London are constructed on a plan that is a great improvement over the way street railways are built in this city. In London they use a rail 8 ins. wide, with a flange at the bottom 6 ins. across. At the top it is 3 ins. across, allowing 1½ ins. for the wheels to run on, a 1-in. groove for the flange of the wheel, and ½ in. for an inside space. The top of the rail is perfectly level across, so that when laid the inside and outside edges of the rail are true to the crown of the street, thereby avoiding the cramping and sliding of wagons and other vehicles in crossing the tracks. They use no stringers, sleepers or spikes. The rail is laid on the concrete, the ends well bolted together by plates inside and out. The pavement is laid up to and between the rails, keeping them in place.

THE MANUFACTURE OF GRANITE.

MR. KRISTOFFOWITCH has succeeded in giving clay the hardness of granite, thus permitting of the utilization, in any climate, of a material more easy to extract, handle, and shape than stone.

He mixes common clay in certain proportions, and raises it to an excessively high temperature in molds. As it comes from the furnace, it is in a compact, homogeneous state, without air holes, fissures or vitrification, and any form may be given to it. The resistance is in direct ratio of the pressure that the material has received.

The grain of the material depends upon the sieves used after pulverization. For paving stones for streets, and for other materials designed for heavy work, the sieves have larger meshes than those used for preparing the powders employed in the manufacture of marbles and plastic objects. The powders for sculptures must be of exceptional fineness, obtained by the precipitation of the materials in special baths. Upon the whole, the ordinary mode of production closely resembles the manufacture of refactory bricks.

The scale of colors is quite varied, and runs from black to light brown. The colors are obtained by a diversity of mixtures and by the degrees of baking.

Mr. Kristoffowitch calls the product pyrogranite, on account of its hardness, which approaches that of granite, and of its aspect, for the mixtures, before baking, may receive grains of baked bricks of several colors, that are incorporated in the paste, and give the material the appearance of granite after being polished. Imitations of marbles and porphyry, with grains and marbling, are obtained in the same way. As for hardness, it is only necessary to say that pyrogranite cuts glass.—*The Manufacturer and Builder.*

THE WATER SUPPLY OF MEMPHIS.

THE city of Memphis, Tenn., formerly noted for its bad sanitary condition, has been improved in an extraordinary degree, partly by an improved system of sewerage, but chiefly by a supply of pure water. The city water was formerly drawn from wells and cisterns and later from Wolf River, but in both cases the surface water which yielded the supply was of very poor quality and contained many impurities, making it unfit for use and a constant cause of disease. Recourse was at last had to artesian wells, and it was found that at a depth of about 350 feet there was a stratum of water-bearing gravel, the water being of exceptional purity, and abundant in quantity. The city supply is now drawn entirely from these wells, and the works present many points of interest. The water-works draw their supply from thirty-two deep wells, which discharge into a tunnel, an arrangement adopted to prevent any influx of surface water. This tunnel is about 3,000 feet long, is lined with brick and conducts the water to a large well at the pumping works, from which it is pumped up and into the supply pipes. The quantity of water is abundant for all present needs, and it is believed that any future increase in requirements can be met by increasing the number of wells. The geological formation of the country indicates that the water-bearing gravel is supplied from the hills of Middle Tennessee, where the rainfall is free from contamination, while the water is further subjected to a filtering process by the gravel through which it works its way.—*Railroad and Engineering Journal.*

A NEW SEWER EXCAVATING MACHINE.

A NEW excavating machine has been designed by a Boston inventor. It conveys a line of loaded buckets passing out and a line of empty ones returning to be filled at the same, the operation being continuous and necessitating the handling of the excavated material but once. It is claimed for the new machine that it is an improvement on the old in rapidity and cheapness of operation. It consists of a light wooden framework mounted on small wheels; these rest upon light I rails, by means of which the apparatus can be moved along to keep it up to the working face of the trench. Upon this framework is stretched an endless wire table, running on sheaves on either side of a center line. The cable passes around sheaves at each end of the railway and is driven by means of a chain passing around a drum upon the engine-shaft. On one side of the framework the buckets are advancing and on the other returning. The buckets are made with shutter bottoms and an automatic opening or unloading device, operating in a similar manner to those on dredge buckets.

By a single motion of a handle which is connected with an eccentric, a clamp is brought firmly down upon the cable, which carries the loaded bucket to a place where the material is emptied and then returns it to the starting point. The inventor of the machine is Mr. F. E. Galloupe, of Boston.

HOW TO MAKE A CITY.

"MOSSBACKISM versus modern methods in the result is shown in the history of Minneapolis and St. Paul, with the latter presenting the mossy side of the case." The speaker was a St. Paul man briefly in Kansas City on business.

"I've lived in St. Paul since '71, and I get sultry when I look back and see where we missed it and Minneapolis caught firmly on. St. Paul was a big town when Minneapolis was still in the ante-chamber of time. If you had told me eighteen years ago Minneapolis would race ahead of our town I should have looked on you as some humorist and made mirth and scoff of you.

"Minneapolis is a bigger, richer, handsomer city than St. Paul. St. Paul, by lying still and doing nothing, performed a great part in making her so. This talk sounds funny from a St. Paul man, but I'm tired of lying. I'm going to tell the truth and see how it feels if I get tarred and feathered when I return. Minneapolis is ahead and keeping ahead. Three out of every four newcomers to that part of the world go to Minneapolis. They pass by St. Paul like so many Levite, on the other side of the way, and steer straight for the Flour City. It makes me sick.

"How did Minneapolis manage this supremacy? That's easy. St. Paul is, as Western cities go, old. She was a great big spot on the map away before Minneapolis. In that older element, unfortunately, it had, still has, in fact, a host of mossbacks—hard-shell, terrapin sort of people—who always go at a walk. They wouldn't spend a dollar, and think more of a gold piece than an eye-tooth. Eye-teeth ain't in it with money; take their notion. These mossbacks wouldn't do anything nor let anyone else. They

wouldn't spend a cent. Jog-trot methods and mud roads: that was their way.

"Minneapolis was and is different. She didn't have any mossbacks. All modern men—those outcasts who built up Minneapolis. They went at city building as they did at private business. They didn't begin by putting hobbles on themselves and calling it safe conservatism like St. Paul. They paved, sewered, curbed, made parks and planted trees and had some style about them. They built palaces for their public buildings. They made a beautiful and attractive city, in fact; one that a man would like to live in.

"There was no similarity in the two cities. Minneapolis was aggressive, modern, public-spirited; St. Paul was slow, mossy and howled if you spent a dollar. Minneapolis wore shoes; St. Paul went barefoot. One dressed up and had the rich air of prosperity; the other donned a tow shirt, patched its overalls and seemed hard up.

"As a fact at that time St. Paul was richer, bigger and stronger than her rival. But she didn't look it—didn't act it. She had the air and ear-marks of unsuccess and hard luck. Minneapolis was right the other way.

"Now, people don't join fortune with failure, or anything that looks like failure, so immigration went clear of St. Paul. Minneapolis was bright and even with the times, trotting neck and neck with the age we live in. She had everything every other city had. It might come high, but Minneapolis must have it. There was nothing too opulent for her. They were a sanguine, bumptious set, these Minneapolis people. But they got everything a nineteenth century city should have, and so immigration went there.

"The first thing St. Paul noticed, everybody seemed going to Minneapolis to live. The second thing was that those extravagancies of her rival turned out in the light of time to be the best investments a city ever made. Paid great big dividends; more than their cost a dozen times. Their curbs, and sewers, and pavements, and parks, and trees, and boulevards, and what not that to us over in St. Paul looked at first like the wild flights of some municipal spendthrift galloping on to ruin, put up the value of contiguous property six, eight and ten fold its aforetime figure. We St. Paul people hadn't thought of that. I could take you to Minneapolis and point out $5,000,000 worth of public works, which, if it were torn out and all hope of its restoration refused, would bring $100,000,000 worth of private property which lies adjacent down to $20,000,000. That vanishing $80,000,000 has no foundation but the $5,000,000 worth of city improvements, and you take the last and the other sinks and disappears. A man who says public improvements don't pay, better get out on the prairie and live in a dug-out. He can't be too hasty about it, either.

"But St. Paul has begun to rub her conservative eyes. Like that celebrated person who walked off the bridge in the dark, she saw where she missed it in the morning. She now goes in for pavements, parks and boulevards. There have been six or seven breathing places added to the city assets in later years. She is right now laboring on a boulevard that is to be the street of the world. It took time, but St. Paul learned the lesson at last. Minneapolis is way ahead, but we are going to trot the heat out anyhow. Our rival may fall down or throw a shoe or break a sulky wheel, and St. Paul be a winner yet."—*Kansas City Star.*

PRIZE PAPERS ON ROAD MAKING.

SOME time ago the University of Pennsylvania offered prizes amounting to $700 for the best papers on Road Making and Maintenance. A committee consisting of A. J. Cassatt, Wm. Sellars, Jos. M. Wilson, Thos. M. Cleeman, W. H. Wahl, Hon. Wayne McVeagh and Prof. Lewis M. Haupt, has awarded the first prize of $400 to Mr. Henry Irwin, B. S., C. E., assistant engineer Canadian Pacific Railroad, Montreal, Can.; the second prize, $200, to Mr. David H. Bergey, B. Sc., M. D., North Wales, Pa., and the third prize of $100 to James B. Olcott, South Manchester, Conn., with honorable mention of Francis Fuller McKenzie, C. E., Germantown, Pa., Frank Cawley, B. S., instructor in engineering, Swarthmore, Pa., Geo. B. Fleece, C. E., Memphis, Tenn., Chas. Bunchard, Philadelphia, Pa., and Edwin Satterthwait, president of the Cheltenham and Willow Grove Turnpike Company, Jenkintown, Pa.

IMPORTANCE OF STREET PAVING.

ALL of the European nations, in fact civilized nations all over the world, regard the improvement of the streets as not less important than the other vital branches of state or municipal government. In France, there were exhibited at the Paris exposition of last year, eighte-n varieties of natural paving stone, grown in the republic, and accompanyning each specimen was a chemical analysis made by one or other of the state chemists. In addition to this there were many varieties of concrete composition on exhibition, with an accompanying analysis of each, and a schedule as to solubility, porosity, resistance to sledge-hammer pressure, etc.

In London there has been for a number of years a standing committee of scientific men, whose duty it has been to study the question of street paving, to make trial, at government expense, of any new pavement discovered that would give any promise of bettering the general condition of the streets. This committee said authoritatively in its last report to the crown, that no new discovery had been made in street paving during the present century. Fleet street and the Strand of London have just been re-paved. Those who know London, even by report, will remember that these streets are the two great business thoroughfares of the English metropolis. The London commission of street paving was urged to prevent the paving of these streets with wood blocks and to order granite, but after a most careful inquiry into the subject, the commission advised the use of the blocks, and blocks were used. Yellow pine was used on a part of Fleet street, but by far the greatest portion of both these busy avenues was paved with Australian "jarrah" wood—a species of locust.

At Sheffield experiments have been made persistently for many years at different portions of the city. Just now sentiment seems, from reports, to be leaning toward a pavement made of wood blocks set in an iron frame. A private firm is exploiting this variety of pavement before the government commission, but no reliable reports are at hand as to the likelihood of its practicability.—*Chicago Post.*

BRICK STREET PAVING IN THE WEST.

ALL through the west they are using hardened brick for paving, and I learn that it is considered almost as good as the best asphalt and is far cheaper. It makes a smooth, hard street and is very clean and healthful. The usual way of laying brick pavement is to grade the street and put in a bed of gravel, cinders or broken stone, over which a layer of sand is distributed and rolled down solid. In some places a layer of brick laid flat is then put in, but this increases the expense and is seldom done except in old and wealthy towns. The bricks are laid on the sand edgewise and fine sand swept into all the crevices. Tar is then poured in and more sand swept over the brick, when a stream of water is turned on to wash the sand down into all the interstices and your pavement is finished for years. I was in Jacksonville, Ill., a short time ago and they were tearing up a brick pavement to build a sewer. They told me that the pavement had been down nearly ten years and was laid on prairie mud, with only a sand and gravel foundation, yet not a brick was found broken and there were no holes in the street. It was no side street, but the main street, where there is as much or more travel as on your Genesee or Washington avenues. The average cost of this brick pavement is about $1.80 per yard, sometimes a trifle more and sometimes less, according to the amount of grading to be done. The wooden pavement days are gone and the old stone is fast being superseded on account of its racket. The brick pavements are found to be smooth, practically noiseless, clean and not very hard on horses. In many places in the west where they have no good sewer system, they reverse the usual crown of the streets and lay their brick so that the center of the street is lower than the sides. This sends all the dirt to the center of the street and the rains carry it all away, leaving the streets clean and free from any foulness. Asphalt is probable better than

brick where you can afford it, but the brick is fast becoming the popular pavement on account of its durability and cheapness.—*Interview in Saginaw Courier-Herald.*

A PROCESS OF PURIFYING WATER.

THE principle of the Anderson process of purifying water is the showering of small pieces of scrap iron, such as punchings of plates, through a stream of water. This is accomplished by means of a cylinder rotating horizontally on hollow trunnions fixed at its two extremities.

The impure water enters by one trunnion and passes through the cylinder at a regular speed and is discharged by the opposite trunnion. During the flow of water through the apparatus scrap iron is scooped up by shelves attached to the cylinder and caused to fall through the stream of water. By this means the iron is kept constantly polished and in the most active condition for purifying the water.

The inventor of the process is William Anderson, an eminent English civil engineer. The chemical effect of the agitation of the iron in the water is to create an oxide of iron which, on leaving the cylinder, is precipitated in the form of rust.

In the process of its formation the rust coagulates the clay or other suspended matter in the water and forms with it a flocculent precipitate. This precipitate is eventually strained out of the water by a bed of sand, leaving the water brilliantly clear and free from both suspended and organic matter. The process has been in use for several years in Europe for the purification of city supplies, being readily applicable to large volumes of water. The revolving purifier, as it is called, is owned by an English syndicate.

A VERY FAVORABLE EXAMPLE.

SPECIALTIES in journalism are becoming more prevalent and more sharply defined as population increases and industries expand and multiply. A recent and very favorable example of this kind is PAVING AND MUNICIPAL ENGINEERING, a new journal published monthly at $1 a year at Indianapolis, Ind. It is devoted specially to street and sidewalk paving, water-works construction, bridge building, street lighting, sewerage, and all matters pertaining to public improvements in cities. It is conducted with spirit and ability, and will render valuable service in an important field. —*Mechanical News.*

A UNIVERSAL CEMENT.

A CEMENT of universal adaptation, that is readily and permanently adhesive to any substance, has long been a desideratum, and to its realization Professor Alexander Winchall appears to have successfully directed his skill as a chemist. His method is to take two ounces of pure gum arabic, one and one half ounces of fine starch, and one half ounce of white sugar, the gum being then pulverized and dissolved in the same quantity of water as is commonly employed in laundry operations for the quantity of starch indicated, and both starch and sugar are dissolved in the gum solution, the mixture being now suspended in a vessel in boiling water until the starch becomes clear. The cement should be as thick as tar, and remain so, prevention from spoiling being insured by dropping in a lump of gum camphor or a little oil of cloves or sassafras. This cement is so very strong and tenacious that it will hold immovably to glazed surfaces, will repair broken rocks, minerals, and fossils, and has innumerable adaptations in the mechanical and industrial arts.

WORK OF A REFUSE DESTROYER.

THE town refuse destroyer, at Leeds, England, deals with seventy tons of refuse daily, including in this dead pigs, dogs, etc. The furnaces are fed by the fuel in the refuse, and steam produced by this operates an engine and mortar mills which convert the cinder and slag into mortar. One part of lime is added to three of ground clinker, and the product sells readily for $1.25 per ton, and nearly pays the cost of the works. Four men, two in the day and two at night, operate the works, and these are each paid $7.50 per week. The refuse destroyer, recently built at Hastings, and costing about $20,000, has proved a success in its ten months' operation, and has already saved much money. It was recently inspected by the representatives of sixteen corporations, and eight of these have decided to adopt it.

A NEW PAVING MATERIAL.

A NEW paving material is manufactured by the New Jersey Asphalt Pavement and Conduit Company. It is claimed for it that its distinctive merit is that it contains no moisture and is therefore unaffected by heat and cold. Calcined clay is made into blocks, and the moisture driven out at a high temperature. Asphaltum is used as a binding material. The company's method of making pavements is covered by patents, and the only territory sold is New Jersey. They announce that they are prepared to erect plants in connection with brick yards in the West.

THE MOVEMENT FOR BETTER ROADS.

To the Editor of Paving and Municipal Engineering:

AN expression in your leading editorial in the October issue might be rather misleading and I ask leave to correct it. You say: "Though the movement for better roads has within a few years had very remarkable growth in the majority of the states, no steps have been taken to secure improvement by organized effort." Allow me to mention two or three that have come under my observation.

The League of American Wheelmen in their constitution particularly state that one prime object shall be "to secure improvement in the condition of the public roads and highways." They have been earnestly engaged in promoting this object for a number of years both through their national and state organizations. They have as their second committee in their organization at large a "Committee on the Improvement of Highways," at the head of said committee being Mr. Isaac B. Potter, of New York, well known throughout New York and the country as the champion of road improvements. Through their state organizations they have labored earnestly to bring before the state legislatures bills looking to systematic improvements, and the making of laws that shall carry them into effect. In Massachusetts, New York, Pennsylvania, Rhode Island, Maryland and Ohio have efforts been made in this direction, in the first named state the larger part of the expenses having been borne by Col. Albert A. Pope.

The Carriage Builders' National Association also has a road improvement committee, with Col. Albert A. Pope as chairman, and under his lead much good will undoubtedly be done, as he is known all through the United States for his philanthropic efforts towards the improvements of streets and highways. And in this connection it may be said that Colonel Pope has recently presented the Massachusetts Institute of Technology with $6,000 to found a course in road engineering, where it will be possible for a young man to perfect himself in the knowledge of the construction of highways. The instructor in this coure is also to hold himself in readiness to advise with street and road superintendents as to the best course to pursue in given localities.

In many of the states also, notably in New York and Pennsylvania, road improvement associations have been formed to secure legislation in favor of good roads. These associations have placed the work in the hands of committees and much has already been accomplished.

The movement is progressing rapidly, but there is still room for organized effort in this direction. Especially is this needed among the farmers, who will be the class to obtain the largest benefits from improved highways, and who, perhaps, are least alive to the necessity of earnest, systematic work in this direction.

HENRY H. COLE.

ONE OF THE COMING GREAT INDUSTRIES.

THE manufacture of hard brick is one of the coming great industries of this country. Thousands of miles of streets in cities and towns will be paved with brick, and perhaps eventually the same material can be utilized for narrow roadways on country thoroughfares.—*Muscatine Journal.*

PAVING AND MUNICIPAL ENGINEERING

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Communications are invited, and all requests for special information on the subjects treated by this journal will receive careful attention.

Articles relating to the different branches of municipal engineering are desired. Stamps should accompany manuscripts for return postage if unavailable.

The columns of this publication are open to the discussion of all subjects relating to paving, sewerage, water-works, street-lighting, and the physical improvement of cities. Practical information as to the merits of materials used in such work and new methods, with photographs and drawings, which may be used for illustration, are especially desired. We are glad to get brief notes as to proposed improvements and the letting of large contracts.

City engineers are requested to send us as early as possible copies of their annual reports, which will be given proper notice.

Articles relating to methods of road making and maintenance are invited.

THE CUSHION COAT OF ASPHALT PAVEMENTS.

To the Editor of Paving and Municipal Engineering:

DEAR SIR—In the laying of asphalt pavements I observe that two coats are used. The first, or "cushion coat," is said to contain from two to four per cent. more asphaltic cement than is used in the surface coat. In many of the asphalt pavements rolls or ridges may be seen, as to indicate the possibility of the surface coat having crept on the "cushion coat" and formed ridge-like or lumpy places. Is this not a probable result from laying the two coats, and what is the use or necessity for the "cushion coat?" If a "cushion coat" be deemed essential, why should it contain a greater percentage of asphaltic cement than does the surface coat? Why could not tar be used instead of asphaltic cement in covering the sand for the "cushion coat," and thus lessen the cost of the pavement, or would it be injurious to do so?

By answering the above questions you will confer a favor upon

AN ADMIRER OF ASPHALT PAVEMENTS.

COLUMBUS, O., November 29, 1890.

In the first place, the rolls or ridges referred to in asphalt pavements are not the result of the use of the cushion coat, but sometimes the result of imperfect grading, but oftener the result of the manner of rolling the pavement. The cushion coat has been advocated by the older companies in the business; first, as the means of absorbing whatever dampness remains in the concrete foundation; second, to level up the inequalities of grade; third, as its name implies, to afford a soft cushion, thereby insuring elasticity for the pavement. The object of the use of the greater per cent. of asphaltic cement in the cushion coat is to insure the softness causing the elasticity referred to. Tar should not be used in this connection, nor, in fact, anywhere in combination with asphalt, owing to the fact that it is impossible, with the present manufacture of the article, to get good, pure tar, and, second, because of its greater susceptibility to heat and cold. In summer it becomes very much softer than asphalt, thereby causing the pavement to mark seriously; and, in winter, very much harder and more brittle, and, therefore, more susceptible to abrasion under the traffic of passing vehicles.

It is entirely practicable to adopt a formula for asphalt pavements which will insure the desired elasticity, and, at the same time, obviate the necessity of the cushion coat; therefore, it is adopted as recommended solely upon the grounds of economy. In Washington, where the maximum price allowed by Congress has been so limited as to restrict the laying of the best class of asphalt pavements, this theory has been put in practice.

THE New York State Roads Improvement Association has held no meeting since last March. The work of the organization has devolved largely upon the President, Mr. Wm. A. Sweet, of Syracuse, N. Y., who, in addition, to preparing bills for introduction in the legislature providing for a new and better system of road improvements, has been assiduously endeavoring to strengthen the association by interesting in its work all people in the state who are concerned in the matter of better highways, including supervisors, road commissioners, path masters and town and city officials, besides ascertaining the actual assessed valuation of each city and village in the state. He has recently commenced an article on road making, which, when finished, will be sent to the farmers of the state with the hope that it will stimulate their interest in the improvement of the highways and give them a better understanding of how the work should be done. Although he has accomplished much, Mr. Sweet says that he has not done all that he intended to do when he accepted the position of president of the association, which, however, was forced upon him. In a recent letter to the editor of PAVING AND MUNICIPAL ENGINEERING, Mr. Sweet said: "If any improvements are ever made in this state the work must be done very much as the abolitionists went about freeing the slaves—by persistent energy and work, day and night, and the education of the people that such things are wrong and that there is a way to right them. It is going to be the work of years, and whether I shall continue it longer than the first of March, as I feel to-day, I have my doubts. While everyone of fairly reasonable intelligence will say to you that something should be done, there is not one in a thousand who will even join the association and pay in one dollar toward helping it to do its work." The work of any organization is done by comparatively few men, usually by one or two; especially is this true of public-spirited organizations. The New York association has been particularly fortunate in its selection of a president. He has accomplished much more than he himself thinks. People may be slow to connect themselves with an organization which

they think does not need their active support. But when such a movement is started and is intelligently directed it stimulates interest in the good purposes to which it is devoted more than can be immediately perceived, and exerts a very powerful influence in developing a better sentiment in the subjects which are given its attention. One of the great needs of the times is more such organizations in the country as the one in New York.

MR. ERNEST ADAM, city surveyor of Newark, N J., who resigned two months ago, has been re-elected by the common council to the same position. It was found that his twenty-six years experience in Newark city matters made him too well-fitted for the position to lose, when no other engineer was to be found in Newark to whom the position could well be given without, at least, temporary disadvantage to the city. His salary was also raised from $2,100 to $3,500 per year. Civil service in municipal engineering is now and then successful.

THE American Society of Civil Engineers is confronted with a troublesome question. The board of directors have decided that Mr. John C. Trautwine, Jr., an associate member, is not eligible to the office of secretary, but there is reason for doubting that their conclusion is fully sustained by a strict interpretation of the constitution of the society. While it may have been the intention in framing the constitution that non-resident members should not become officers, this purpose has not been declared in the laws governing the organization, and on the question of Mr. Trautwine's eligibility there is in contradiction of the opinion of the directors, a concurrence of legal opinions that he may, if elected, lawfully hold the office for which he has been nominated.

IN accordance with a suggestion which was made some time ago by Mayor Hart, of Boston, the State department has undertaken to collect information through United States consuls regarding municipal engineering in foreign cities, and will soon begin the publication of a series of reports on the subject, which may well be expected to be of much public benefit. There is a generally felt need of all obtainable knowledge regarding municipal improvements, and it is doubtful if there is any subject to which the State department could properly direct attention that would cause a greater demand for and interest in the published consular reports.

PERSONAL.

Mr. W. G. Miller, of Easton, Pa., has been appointed county surveyor of Lebanon Co., Pa.

Mr. Edwin H. Hobbs, late state senator and civil engineer of the Amoskeag corporation, died on Nov. 27, at Manchester, N. H.; aged 55 years.

Mr. Wm. B. Knight, M. Am. Soc. C. E., of Kansas City, Mo., of which city he was city engineer for several years, was very seriously injured by being bruised and badly scalded in a railway wreck at Jacksonville, Ill., on the Chicago & Alton R. R., on the morning of Dec. 4.

Mr. A. W. Cook, late principal assistant engineer of the street department, has been appointed city engineer of Chicago. Acting city engineer Cheney returns to the charge of the sewer department.

At the regular November meeting of the Engineers' Club of Cincinnati, O., Mr. J. C. Lemon read an interesting paper on cast-iron water pipes, which was afterwards discussed by the members present.

The nominations for officers of the American Society of Civil Engineers for 1891, are: President, Octave Chanute; vice-presidents, John Bogart and Charles Hermany; secretary, John C. Trautwine, Jr.; treasurer, George S. Greene, Jr.; directors, Theodore Cooper, Rudolph Hering, Edward P. North, Clemens Herschel and S. Whinnery. The elections announced at the last meeting were: *Members*—Francis R. Fava, Jr., Washington; Alexander E. Kaste, Tampico, Mexico; James Richie, Pittsburgh, Pa.; John N. Ostrom, New York. *Associate*—Henry S. Jacoby, Ithaca, N. Y. *Juniors*—Henry L. Davis, New Haven, Conn.; Walter D. Dusenberry, New York; Geo. H. Paine, Swissvale, Pa.; Lee Treadwell, Sioux City, Ia.; and Arthur L. Shreve, Baltimore, Md.

VIDE ET CREDE.

By W. L. S. Bayley, C. E.

WHEN Portland cement cements, a greater or less quantity is very liable to injure the bond. Does the cabinet maker join his fine woods with half an inch of glue?

When common labor handles Portland cement it results in uncommon waste!

The supervising architect or inspector who says, "Be sure that you get in enough cement," with all that that implies, is not a safe counselor.

All expert work costs much money.

All sidewalk returners should be circular. They should be turned on a radius equal to the widest intersecting walk. If nature abhors a vacuum she detests an angle, though it be "right."

Quartzite roads bonded with selenite cement will render your roadbed water and dust proof.

THE SEWAGE OF FOREIGN CITIES

AT a meeting of the Balloon Society of Great Britain, held recently, Dr. C. R. Drysdale, F. R. C. S., read a paper on the subject of sewage. The lecturer demonstrated that the only rational and satisfactory method of treating the sewage of large cities was that now employed at Berlin, Paris, Croydon, and at a few other places on a less extensive scale, and its agricultural application on suitable soils. London presented a very bad example to other cities in the manner in which it dealt with its sewage by turning at least 150,000,000 gallons daily into the Thames at the outfalls of Barking and Crossness, and by unwisely and inadequately dealing with the solid matters. Glasgow and Dublin were even more lamentable failures in this respect. At present Paris had 1,500 acres of land cultivated by small proprietors who make use of 20,000,000 tons per annum to irrigate their farms. Some 3,000 acres have also been acquired at Achéres, which it is proposed to cultivate in the same manner, and other sewage farms were contemplated. The effluents were perfectly pure, and even drinkable. At Berlin the area of the sewage farms amounted to 19,000 acres. The crops grown were grass, roots, cereals, potatoes, cabbages and fruit. Sixteen million fifty-five thousand dollars had been borrowed for successfully dealing with the sewage of 1,500,000 inhabitants, while Sir R. Rawlinson estimated that the present sewage experiments in London with over 5,000,000 inhabitants would cost $50,000,000 for no purpose whatever.

THE Engineer's Club of the University of Illinois has issued a pamphlet giving selected papers read before the club during the term of 1889-90, some of which are exceptionally interesting and valuable. Copies, at 30 cents each, may be obtained from the secretary at Champaign, Ill.

Improvement and Contracting News.

PAVING.

Watkin, N.Y., is agitating for better pavements.

Orange, Tex., is talking of issuing street improvement bonds.

John McGlynn has the contract to open 95th street, Brooklyn, N. Y.

Mr. Hays has the contract for considerable paving work at Tampa, Fla.

The Erie, Pa., council will be petitioned to pave 10th street with asphalt.

The Wilkinsburg, Pa., council will be petitioned to re-pave Penn avenue.

Harrison street, Davenport, Ia., between Front and Second, is being paved.

Main and several other streets in Sun River, Mont., will be paved in the spring.

Samuel Katz has been awarded the contract for grading Tenth street, Omaha, Neb.

Springfield, Mo., will spend about $250,000 for paving streets with brick next year.

Messrs. Shandley will probably be awarded the contract to pave Mary street, Elizabeth, N. J.

Assessments have been made for grading and paving numerous streets in New York City.

The Provo City, Utah, council will lay asphalt pavement on numerous thoroughfares.

The highway committee, Brockton, Mass., has voted to build sundry avenues.

South Limestone, West Main and High streets, Springfield, O., will all probably be paved.

It has been decided to pave Lake street, with cedar blocks, from Oak Park, Ill., to Austin.

The park commissioners of Tacoma, Wash., contemplate the improvement of G street.

The supervisor has been authorized to improve and grade Union street, Middletown, Pa.

Ordinances have passed the San Francisco, Cal., council for an immense amount of street work.

A new road will be built north from the corner of Washington and Division streets, Ft. Dodge, Ia.

Ninth street, Chattanooga, Tenn., will be re-paved, as the work done formerly was unsatisfactory.

Dennis Norton will probably receive the contract to pave and grade Sycamore street Brooklyn, N. Y.

West street, New York City, and sundry streets at Trenton, N. J., and West Chester, Pa., will be widened.

The Southern Paving Company will commence work paving Whiteside street, Chattanooga, Tenn, at once.

Montgomery, Ala., will petition the legislature for the authority to issue $50,000 of street paving bonds.

Joseph P. Egan has the contract for paving and macadamizing Front and Paxton streets, Harrisburg, Pa.

Matthew Hays has been awarded the contract for paving Franklin street, Tampa, Fla., with cedar blocks.

Ordinances are before council providing for the paving and improving of sundry streets in Trenton, N. J.

Ordinances are before the Boston Board of Aldermen providing for the paving and improving of sundry streets.

An ordinance passed the Salt Lake City, Utah, council for paving First East street with asphalt and stone blocks.

The Winston, N. C., street commissioners will purchase a stone crusher. Numerous sidewalks there will be graded.

Ordinances have passed the Brooklyn, N. Y., council providing for the grading, paving and flagging of a number of streets.

The mayor and city council of Dubuque have come to the conclusion that cedar blocks are undesirable for paving alleys.

The Jasper Land and Mineral Company, of Jasper, Tenn., has let a contract for grading 24,000 feet of the principal streets.

The Atlantic City, N. J., council has passed an ordinance providing for the establishment of a permanent grade of streets.

The Board of Public Works of St. Paul, Minn., has awarded the contract for grading Simpson avenue to Keough & Donnelly, at $1,110.

The Western Paving and Supply Company has been awarded the contract for paving North Illinois, Tennessee, and West Ohio streets, Indianapolis, Ind.

New Jersey avenue, Kansas City, Mo.; Perry street, Manchester, Va.; Third street, Ocala, Fla.; and sundry streets in Steelton, Pa., will be graded and paved.

The new granatoid pavements in Centralia are becoming quite popular. By another season it will be the popular walk at every handsome private residence in the city.

According to the Dubuque *Telegraph*, the council of that city has decided to hereafter use brick in street paving, and will begin by putting it down on Iowa street.

The City Commissioners of Dayton, Ohio, have authorized the city engineer to report plans and specifications for curbing and paving Fifth, Main and Third streets and Wayne avenue.

The Eastern Kentucky Improvement and Land Company, of Baltimore, Md., has been incorporated with a capital of $1,000,000, and will lay out and build towns, etc., in the state of Kentucky.

The work of laying off streets in the property of the Ocmulgee Land and Improvement Company, Macon, Ga., has begun. President McBurney says the streets will be made the best in that section of the country.

The Board of County Commissioners of Lafayette, Tippecanoe and Montgomery counties, Indiana, have ordered the immediate construction of the county line gravel road at a cost of $15,000. It will be 11 miles long.

The city engineer of Kansas City, Kan., has completed plans of the Eleventh street boulevard. It is proposed to make the boulevard, from Prospect to Indiana, sixty feet wide, and from Indiana to Centropolis, 100 feet in width.

Doyle street and Livingston avenue, Columbus, Ohio; Washington, Erie and St. Claire streets and Bartlett street from Wait avenue to Forest avenue, Toledo, Ohio, and sundry streets at Allegheny, Pa., and Peoria, Ill., will be improved.

An ordinance has passed the Salt Lake City, Utah, Council for the paving of the whole of First East street, beginning at the south line of South Temple street and running south to the north line of Fourth South street, with asphalt and stone blocks.

Lincoln avenue, Minneapolis, Minn.; Brenton avenue, Jamaica, N. Y.; Twenty-first street, Des Moines, Ia.; Oak street, Albany, N. Y.; Delaware street, Indianapolis, Ind.; Beech street, Norristown, Pa.; and Hays street, Pittsburgh, Pa., will be opened.

The contract for grading and graveling Fourteenth avenue boulevard, Denver, Col., has been let to Jos. W. Osner. The Mount View boulevard will probably be extended, widened and improved at Front. Messrs. Merritt, Grollmon & Winne are especially interested.

Chestnut street, Chattanooga, Tenn., will be paved with Hallwood brick; Main, West Temple, First and Second South streets, Salt Lake City, Utah, with block stone; River street, Troy, New York, with granite blocks, and Fepot street, Middletown, New York, with cobble-stone.

Geneva street, Pittsburgh, Pa.; Ninth street, York, Pa.; William street, New Bedford, Mass.; Hickory street, between May street and Jerome avenue, Owasso, Mich.; Pennell and sundry other streets, Chester, Pa.; Airy and Sweed streets, Norristown, Pa.; Walnut, Passaic, and Ferry street, and Morris avenue, Newark, N. J.; Fulton street, Toledo, O., and sundry streets at Boston, Mass., and Elizabeth, N. J., will be paved.

In Newark, N. J., awards were made for asphalt, granite and trap pavements, November 28. 2½ inches asphalt on 6 inch concrete foundation, 5 year guarantee by bond, @ $2.85. Granite on sand, 1 year guarantee by 5 per cent. of price held back by the city, @ $2.50. Trap rock on sand, 1 year guarantee 5 per cent. of price retained, @ 2.20. There was sharp competition, new bidders on each kind of pavement being present. The usual price of granite on sand is $2 75 and of trap rock on sand, $2.45 per sq. yd.

SEWERS.

A sewer system will be put in at Cisco, Ill.

Concord, N. C., and Linden, N. J., need sewerage systems.

Taylor street sewer, Holyoke, Mass., will probably be extended.

The Salem, Mass., council has appropriated $4,400 for sewers in Gallows Hill.

The Schenectady, N. Y., council has been petitioned for a sewer in Union street.

The York, Pa., council will probably order a sewer to be built on North street.

The Newark, N. J., council will be petitioned for a sewer on South Ninth street.

Haverhill, Mass., will issue bonds for the construction of sewers in sundry streets.

Surveys have been ordered for three 24-inch drains in Christiana avenue, Wilmington, Del.

John D. Sullivan has the contract for the construction of a sewer in Liberty street, Erie, Pa.

The sewer commissioners of Rockaway, N. Y., have adopted a gravitation system of sewerage.

Work will be commenced shortly on the construction of a sewerage system for Manville, R. I.

There is agitation for sewerage systems at Sangerties, N. Y., Roselle, N. J., and Manchester, Va.

The contract for building sewers A. & B., in district No. 15, Topeka, Kan., was let to G. J. Roson at $1,455.

The Tampa (Fla.) Real Estate and Loan Association has asked for permission to lay sewers in Jackson street.

An election will be held at Pittsfield, Mass., to vote on a proposition to bond the town for a sewerage system.

Swigart, Shepard and Atwater have been awarded the contract for the building of new storm sewers at Beatrice, Neb.

The highway committee has recommended the construction of a large underground drain in Ford street, Brockton, Mass.

The chief engineer of Jersey City, N. J., has submitted to the water board a plan for a sewerage system south of Bentley.

An ordinance passed the Covington, Ky., council for the construction of stone pipe sewers from Stewart to Banklick streets.

Ordinances for the construction of sundry sewers have passed council in McKeesport, Pa., Cleveland, Ohio, and Kansas City, Mo.

The Government has been granted permission to construct a sewer from the government building, Winona, Minn., to the river.

The Brooklyn, N. Y., council, at its last meeting, passed resolutions providing for sewers, water mains and culverts on sundry streets.

The Wilkes Barre, Pa., council has ordered that an election be held to vote on a proposition to borrow $75,000 for sewer construction.

Work has been commenced on sewer district No. 7, Hastings, Neb. At the next meeting of the council it is expected that two or three new districts will be created.

Sewers will be laid in Ninth street, Erie, Pa.; Sixteenth street, Troy, N. Y.; Second avenue, Brooklyn, N. Y., and in numerous streets of Patterson, N. J., and Lowell, Mass.

Sewers will probably be built on Cook street, Point Lobos avenue and Laurel cemetary, San Francisco, Cal. The street committee of the board of supervisors has the work in charge.

Sewers have been ordered laid in sundry streets of Rath Beach, N. Y., New Bedford, Mass., and Portsmouth, N. H., and in East Forty sixth street, Bayonne City, N. J., Sumner street, Salem, Mass., and in Bowditch street, New Bedford, Mass.

Work will be commenced on a system of sewerage at Eugene, Ore. Plans were drawn by Messrs. Kelley and Hammond. Fifteen thousand dollars will be expended on the work.

The Rockford, Ill., Council has awarded the construction of the Seventh street sewer to Walker & Company, at $4,653.10. The city attorney was ordered to commence assessment proceedings in the county court for the payment of the new drain.

Sewers will be constructed on Commercial street, Jacksonville, Fla., Twenty-ninth street, Pittsburgh, Pa., East Main street, Greenwich, N. Y., Salem avenue, Elizabeth, N. J., Main street, Spokane Falls, Wash., Forty-ninth and Thirty-third streets, Bayonne City, N. J., various streets of New Haven, Conn., N, P, Q, R, U, Thirteenth and Ella streets, Portland, Ore., Thirty-seventh street, Brooklyn, N. Y., North Duke street, Jackson avenue, Troy, N. Y., and Grape street, Syracuse, N. Y.

Contracts for sewers have been let at Pinkneyville, Ill., to R. E. Gannon, of Murphysboro; at Hancock, N. Y., to W. A. Nichols; at Jewett City, Conn., to William Burton, of Norwich; at South Farmingham, Mass., to Rooke & Berry; at Albany, Ore., across Railroad street, between First and Water streets; at Jersey City, N. J., to Michael Curley and Thomas Cavanaugh; at Ridley Park, Pa., to Edward Riley; at Troy, N. Y., Pawling avenue, to Seery & Anderson; at Utica, N. Y., to John Highes, W. Shout and E. Caughlin.

WATER-WORKS.

At Bessemer, Wis., water-works are being put in.

At Phillipsburg, Kan., water-works have just been completed.

Orange City, Ia., is agitating the question of putting in a system of water-works.

Plans for a $75,000 water-works system at Dayton, Wash., have been completed.

A new water system, to cost $2,000,000, will be constructed at Butte City, Mont.

Water-works will probably be put in at Clear Lake, Ia., Monticello, Ill., and Fairport, N. Y.

Isaiah W. Newcomer, of Cleveland, has been awarded the contract for water-works at Elyria, O.

The Chattanooga Brewing Company, of Chattanooga, Tenn., will lay water pipes on Broad street.

An ordinance is before the water committee of Philadelphia, Pa., providing for a new reservoir.

The San Angelo, Tex., Water-works Company has let the contract for $52,000 worth of improvements.

The Lynn, Mass., Board of Aldermen, at its last meeting, ordered that water pipes be laid in various streets.

Lansdown, Pa., Orange City, Ia., Snohomish, Wash., and Whitestone, N. Y., are arranging for water-works.

A. G. Kingsberry, of Ponca, Neb., is agent for the sale of water-works bonds recently issued by the city.

$70,000 improvements to the water-works system of Independence, Mo., is to be commenced at once. Pipe and pump will be purchased. R. D. Wurt is the superintendent of the water company.

The mayor of Spokane Falls, Wash., has recommended that $100,000 bonds be issued for water-works extension.

The committee to investigate the question of water-works for Ilion, N. Y., has reported in favor of a pumping system.

It has been decided to put in a complete system of water-works at Belvidere, Mo., for which $35,000 has been appropriated.

The contract for sinking a 6,000 ft. well for water-works at Galveston, Tex., has been let to J. P. Miller & Co., of Chicago, at $75,000.

Allegheny, Pa., will probably vote at the next municipal election upon a proposition to issue bonds for a water-works system.

The Hartford Water Company of Montpelier, Vt., and the Nokemis Water Company of Factoryville, N. Y., have been incorporated.

Montgomery, Ala., will petition the legislature for the authority to issue $400,000 bonds for enlarging and improving the water-works.

An ordinance has passed the Salt Lake City, Utah, council for the extension of water mains on Fifth East street and sundry other streets.

The Water Valley, Miss., city council has let contract to A. F. Benson & Co., of Batesville, Ark., to furnish the city with extensive water works.

A system of water-works will be established at Santa Cruz, Cal., Cresco, Minn., Fort Valley, Ga., Liberty, Neb., Yoakum, Tex., and at Tecumseh, Mich.

Water mains will be laid in Morris street, Albany, N. Y., West Main street, Springfield, Mass., Dubois street, Dubois, Pa., and in a number of streets of Lynn, Mass.

A bill has passed the legislature incorporating the Rochester Water works System Company at Montpelier, Vt., and the governor of that town has signed a bill empowering Northfield to bring water there.

The Batesville Water and Electric Light Company has been incorporated at Batesville, Ark., with a capital of $100,000. It will put in water works and an electric light plant. Its president is Samuel B. Hertz.

A bill will probably be presented at the next legislature authorizing the city of Columbia, S. C., to issue $75,000 bonds for the betterment of the water supplies, and for the purchase of additional machinery, filters and pipes.

The Fairland Water-works and Power Company, of Fairland, Tex., capital, $25,000, the Rio Llano Water Company, of San Francisco, Cal., capital $1,000,000, and the Holland Water-works Company, of Holland, N. Y., have been incorporated.

The Davenport Water Company, of Davenport, Ia., let the contract for the largest mechanical filtering plant in the world, to the American Filter Company. The capacity will be 7,500,000 gallons of pure water in twenty-four hours. The company will bond the works for $300,000.

The Ramapo Company of New Jersey, and the Ramapo Company of New York have consolidated, and will make a proposition, shortly, to supply Jersey City with water from the Ramapo water shed. General Egbert Viele, of New York city, is at the head of the company.

Extensions and improvements will be made by the water-works company of Columbia, S. C.; the Fairhaven Water Company, of Fairhaven, Mass.; the Monongahela Water Company, of Pittsburgh, Pa. Improvements will probably be made at Whitestone, N. Y., Paris, Ill., and at Tampa, Fla.

BRIDGES.

The Main street bridge, Le Roy, N. Y., has been condemned.

A double-track iron bridge will be erected at Fort Edward, N. Y., at once.

A large bridge will probably be built at College avenue, Athens, Ga.

A new iron bridge is being agitated to cross the river at Eighth street, Cheboygan, Wis.

A bridge over the Belknap Railroad crossing at West Superior, Wis., is being agitated.

A $30,000 bridge across the Missouri river at Nebraska City, Neb., will be constructed.

The Berlin Bridge Company will erect an iron bridge on its property at East Berlin, Conn.

H. E. Branner, of Bay City, will make plans for a new bridge to be built at Lansing, Mich.

The Great Northern Railroad will erect a bridge over the Columbia river at Brainier, Wash.

A bridge to cost $50,000,000 will be constructed to connect New York City and Jersey City.

The board of public works of St. Paul, Minn., will build a bridge over Phalon Creek valley.

The Greenville, S. C., council has made an appropriation for building a bridge over the Reedy river.

Work on the contemplated Brooklyn, N. Y., bridge improvement will be commenced this month.

Spring Valley, Ill., has voted $5,000 bonds towards the construction of a bridge across the river at that place.

The Smith Bridge Company, of Zanesville, O., has been awarded the contract for building a $90,000 bridge.

John H. Robinson is at the head of a project to build a pontoon bridge over the Missouri at St. Louis, Mo.

The Daring Brothers bridge across the Arkansas river at Little Rock, Ark., has been officially condemned.

The Atlantic Coast Line contemplates building an iron bridge across the Roanoke river at Weldon, N. C., soon.

Contractor Beckel, of Bethlehem, Pa., has the contract to re-build the bridge over Sancon Creek at Hellertown.

A new bridge company has been organized to construct a bridge across the Mississippi river at Burlington, Ia.

Geo. J. Davis, of St. Charles, Mo., has the contract to build a pontoon bridge over the Missouri river at Atchison, Kan.

The Baltimore and Ohio Railroad Company will erect an iron bridge over the Patapsco river at Elk Ridge. H. T. Douglass, of Baltimore, Md., is chief engineer.

Work has been started on the new pier for State street bridge at Rockford, Ill.; there is one more pier to be built.

The Street Railway Company, of La Crosse, Wis., will construct a bridge for its own use over the La Crosse river.

The street committee of Meriden, Conn., have received an appropriation of $14,000 for the erection of two iron bridges.

Superintendent of Public Works Hannan, of Utica, N. Y., recommends the erection of a new bridge over Genesee street.

The Milwaukee Bridge Company has the contract for the construction of a bridge over the Savannah River at Augusta, Ga.

The Fall Brook Coal Company will erect several bridges in the line of the railroad between Corning, N. Y., and Jersey Shore.

T. B. Townsend & Co. have been awarded the contract for the sub-structure of the over-head bridge at Fifth street, Zanesville, Ohio.

A company has been formed at Mantee, Fla., to build a new wharf, to run from the foot of Main street to the river channel. It will cost about $12,000.

The Pottsville Bridge Company has been awarded the contract for constructing the western approach to the Walnut street bridge, Philadelphia, Pa.

W. L. Webb and others, of Salt Lake City, Utah, have petitioned council for the construction of a bridge at the intersection of State and Roper streets.

Col. S. Stewart, of St. Joseph, Mo., has made a proposition to the board of trade to construct a pontoon bridge across the river at Nebraska City, Neb.

The East Omaha Land Company, of Omaha, Neb., has accepted plans for a new railroad and wagon bridge across the Missouri river at that place, to cost $1,500,000.

The Wrightsville and Tennessee Railroad has received permit to erect a draw bridge across the Oconee river at Dublin, Ga., to cost in the neighborhood of $25,000.

A contract has been let to the Kansas City Bridge and Iron Company for building an iron bridge over Black river at the foot of Vine street, Poplar Bluff, Mo. Cost, $5,750.

A bridge will be constructed across the Pecos river at San Antonio, Tex., to be the highest bridge in the United States. The center span is to be 378 feet above the water, and 1,260 feet in length.

There is a project of bridging Milwaukee river at Milwaukee, Wis., from Van Buren to Holton streets. It will require the construction of viaducts on either side of the river, making the estimate cost $250,000.

The Milwaukee, Wis., council has authorized the Chicago and Northwestern Railroad to construct a temporary bridge with a draw of not less than 82 feet over Milwaukee river between Third and Fifth wards, to remain only until the present bridge is replaced with a permanent steel turn bridge with 88 feet draw.

STREET LIGHTING.

The Electric Light Company of Port Deposit, Me., will rebuild its plant.

The Electric Construction Company of Greenwich, N. Y., has been awarded the contract for lighting Whitehall, N. Y., with electricity. A plant will be put in at once.

T. Mason, Jr., has leased the Sumter, S. C., electric light plant for ten years.

Fred. Wildi, Highlands, Ill., is trying to form a company to put in an electric light plant.

The Royal Electric Company, of Peoria, Ill., will construct an electric light plant at Hoopeston, Ill.

The light committee of York, Pa., has approved the contract recently made for lighting the city.

An electric light company has been formed at Culberton, Ga., and an electric light plant purchased.

The Blairesville Illuminating Company, of Blairesville, Pa., will extend its line to Blairdstown and Cokeville.

There is great dissatisfaction found with the street lights furnished at Kenosha, Wis. Electricity is talked of.

The selectmen have been petitioned to make an appropriation for street lighting at South Farms, Conn.

J. J. Hennessy has been awarded a franchise for an electric light plant at W. Sulphur Springs, Montana.

Electric lights have been contracted for at Pawpaw, Mich., Pipestone, Minn., Woodsville, N. H., and Waukegan, Ill.

The Fort Wayne Electric Company is to put in an extensive plant at Indianapolis, Ind., work on which has begun.

Lafayette, Louisville and Erie, Colorado, are agitating the subject of putting in an electric light plant to light all three places.

Mayor Davidson in his annual message will recommend that the city of Baltimore, Md., establish its own electric light plant.

The United Gas Improvement Company of Jersey City, N. J., has been awarded the contract of lighting the city with electricity.

An ordinance has passed the St. Joseph, Mo., council for appropriating $2,000 for the purpose of extending the electric light plant.

The citizens of Granville, N. Y., have authorized the trustees to contract with any company for lighting the village with electricity.

The capital stock of the Spartenburg Gas and Electric Light and Power Company, of Charleston, S. C., has been increased to $75,000.

The Greencastle, Ind., Electric Light Company will increase its capacity. It will put in an incandescent light plant at a cost of $12,000.

The Nanticoke, Pa., town council at its last meeting made a three years' contract with the electric light company for forty-six arc lamps.

The Wells Construction Company have been awarded the contract for lighting Milton, Pa., with electricity. A plant will be erected at once.

A company has been organized at Watseka, Ill., by F. P. Morris, F. P. Martin and J. B. Hooper to put in an incandescent electric light plant.

The Old Dominion Electric Light Company, the Richmond-Schuyler Electric Light Company, the Virginia Electric Light Company, and the Richmond City Railroad Company, all of Richmond, Va., have consolidated.

The Thompson-Houston Electric Company and the Florida Electric Company have submitted proposals to council for lighting the city of Tampa, Fla.

Electric light plants are agitated at Virden, Ill., Wheeling, W. Va., Brighton, Mich., Phelps, N. Y., Springfield, Mass., Tolone, Ill., Rushville, Ill., Paxton, Ill., and Summit, N. J.

The Baldwin Electric Light Company, of Clinton, Ia., has been granted a franchise to build an electric street car line. The company agrees to spend $250,000, and to ask for an extension.

The Midland Terminal and Improvement Company has been incorporated at New Haven, Conn., with a capital of $25,000, for the purposes of electric light plants, etc. W. M. Barse is interested.

The Diamond Electric Company has been incorporated at Philadelphia, Pa., with a capital of $250,000. Chas. A. Porter, Geo. A. Carter and James F. McLaughlin, of Philadelphia, are the directors.

The question of electric light plants is being agitated by Bloomington, Ill., Oshkosh, Wis., Waterford, N. Y., Brenham, Tex., Granville, N. Y., Nutley, N. J., Clear Lake, Ia., Oakdale, Cal., Lexington, Neb., Monticello, Ill., Stratford, Conn., and Loda, Ill.

The plans for the new plant of the Charleston (S. C.) Electric Light and Power Company, which is to be erected on Main street, are being drawn. Several new dynamos will be purchased, and the capacity for furnishing light will be largely increased.

Electric light plants will be put in at New London, Wis., Oxford, Mich.; Sharpsville, O.; Buchanan, Va.; Ithaca, N. Y., incandescent; Effingham, Ill., incandescent; Lockport, N. Y., by E. M. Ashley; Jasper, Tenn.; Elberton, Ga.; Dawson, Ga.; De Pere, Wis.; Wellsburg, W. Va.; Dayton, Ky.; Columbia, Mo.; Maywood, Ill.; and Danville, Ky.

Electric light systems will be established at Ipava, Ill., Fredonia. N. Y., Forest City, Ark., Monticello, Ill., Frederick City, Md., Port Deposit, Md., Sharpesville, Pa.; Chehalis, Wash., Fort Wayne, Ind., Newberry, S. C., Columbus, Wis., Lincoln, Neb., Lockhaven, Pa., New Albany, Ind., Duquoin, Ill., Hanford, Cal., Aledo, Ill., Globesville, Col., Port Angelos, Ore., and Raleigh, N. C.

The Findlay Electric Light and Power Company, of Findlay, Ohio, with a capital of $150,000; the Bellefontaine Electric Light and Power Company, of Bellefontaine, O., capital $25,000; the Spring Garden Electric Company, of Philadelphia, Pa., capital $10,000; a company at Maywood, Ill., capital $25 000; a company at Tuscola, Ill., capital $25,000; the Columbus Electric Light and Power Company, of Columbus, Wis., capital $50 000; the Electric Power Company, of Newark, N. J., capital $150,000; and a company at Crisfield, Md., capital $10,000, have been incorporated.

Extensions will be made to the plants of the Clifton Electric Light Company, Clifton, Pa.; the Marble City Electric Light Company, Rutland, Vt.; the Buffalo Gas Light Company, Buffalo, N. Y.; the Charleston Electric Light and Power Co., Charleston, S. C.; the Boston Electric Light Company, Boston, Mass.; the St. Louis Electric Light and Power Company, St. Louis, Mo.; the McKeesport Electric Light Company, McKeesport, Pa.; the Bangor Electric Light and Power Company, Bangor, Me., and to the plants at Silver Springs, N. Y., Warren, Pa., Lakeland, Fla., Quincy, Mass., Amesbury, Mass., Sioux Falls, S. D., Johnsbury, Vt., and Hackensack, N. J.

STREET RAILWAYS.

A street railway line will be built at Ionia, Mich.

There is talk of building a street railway at Brazil, Ind.

There is talk of building an electric street railway at Sharon, Pa.

The Opelika Street Railway Company has been incorporated at Opelika, Ala.

The Los Angeles Cable Company, Los Angeles, Cal., will equip with electricity.

The Centliver Street Railway Company of Ft. Wayne, Ind., will equip with electric motor power.

Haines Bros., of New York have been awarded a franchise for building an electric railroad between Owass and Caronna, Mich.

The Westside Railway Company, of Kansas City, Kan., has mortgaged land for $150,000 to build an electric line on the north side.

The Progressive Loan and Improvement Company, of Macon, Ga., has purchased the Macon Electric Railway from Geo. F. Wert for $250,000.

A Thompson-Houston Electric Street Railway will be constructed at Chattanooga, Tenn., and will be the property of the East Chattanooga Land Company.

The Day Elevated Railway Plant Company, of Chicago, Ill., has been incorporated with a capital of $5,000,000. Their purpose is to buy up the patents of St. John Day, an English engineer.

PUBLIC PARKS.

Barton, Fla., will lay out a new cemetery.

Boston will lay out Castle Island a public park.

Dr. Seward Webb is laying out a park at Shelburne, N. Y.

The citizens of Troy, N. Y., are agitating for a public park.

The Waco, Tex., Board of Trade will establish a new park.

A $30,000 driving park will probably be established at Dallas, Tex.

The Commercial Company of Cedar Rapids, Ia., will lay out a fine park.

Germantown, Pa., will probably purchase a tract of land for a public park.

Extensive improvements will be made to Goodale park, Columbus, Ohio.

The city of Baltimore, Md., has purchased a tract of land and will lay out a park.

The Park Commission has purchased a site for a sea-side park at New Haven, Conn.

The Red Springs Improvement Company will lay out a park at Glen Cove, N. Y.

John Hadtner, Williamsport, Pa., has purchased Union Park, and will improve it.

The Flushing Park Improvement Society has been incorporated at Flushing, N. Y.

The board of aldermen of Fall River, Mass., has voted to purchase land for a public park.

The park commissioners of Bayonne City, N. J., have purchased a site for a public park.

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The Chamber of Commerce, St. Paul, Minn., contemplates laying out a reserved park at once.

A land improvement company has purchased Deen Park, Pottsville, Pa., and will lay out streets.

There is considerable talk of establishing a large park outside the present city limits of Clinton, Iowa.

Four hundred thousand dollars has been appropriated for the proposed parks in West Superior, Wis.

A public park will be laid out at once in Washington, Penn., Samuel Hazlett and J. B. Wilson have it in charge.

New Bedford, Mass., at the December election, will probably vote on a proposition to lay out a public park.

The Weatherford Park Improvement Company of Weatherford, Tex., has been incorporated, to lay out a city park.

The Philadelphia council has ordered that Vernon Park be placed on the city plan, and that Bartram Park be opened.

The old Methodist cemetery between the Reading road and Burnett avenue, Cincinnati, Ohio, will be used for park purposes.

The park commissioners of Jersey City, N. J., will urge the board of freeholders to endeavor to float $600,000 of bonds for the purchase of parks.

A special committee has been appointed by the city council to take into consideration the matter of establishing a public park at Nashville, Tenn.

The Bethlehem Fair and Park Association, of Bethlehem, Pa., has directed the borough engineer, Grossett, to survey a tract of land, and prepare plans and specifications for laying out the grounds for a driving park.

The park commissioners of Milwaukee, Wis., will ask the common council for, and the legislature to authorize the issuance of, $700,000 bonds to pay for, and improve park sites already bought, and to establish a park on the west side.

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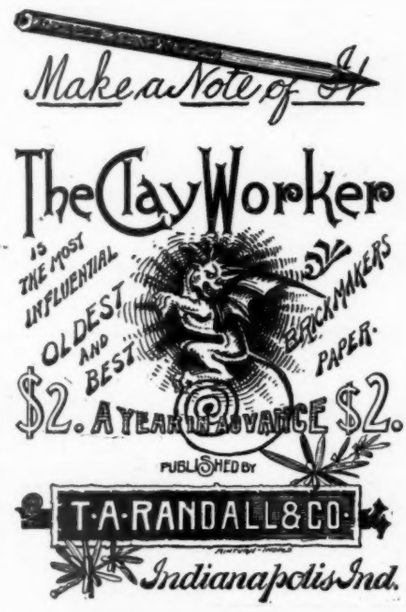
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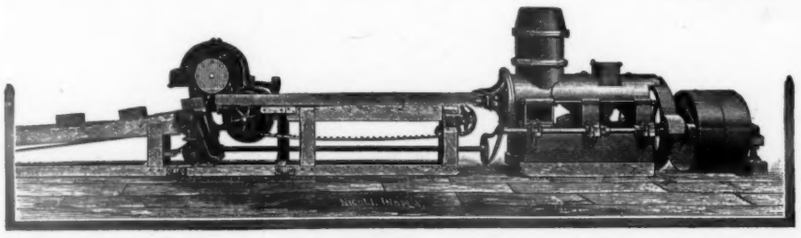

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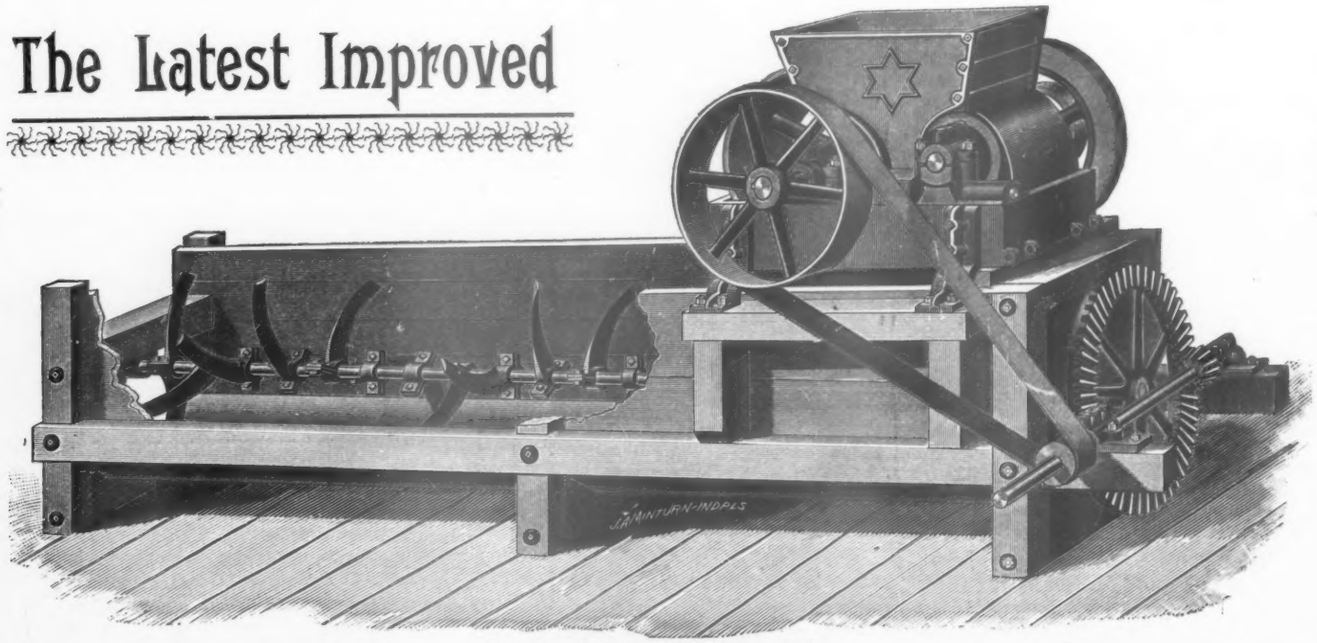

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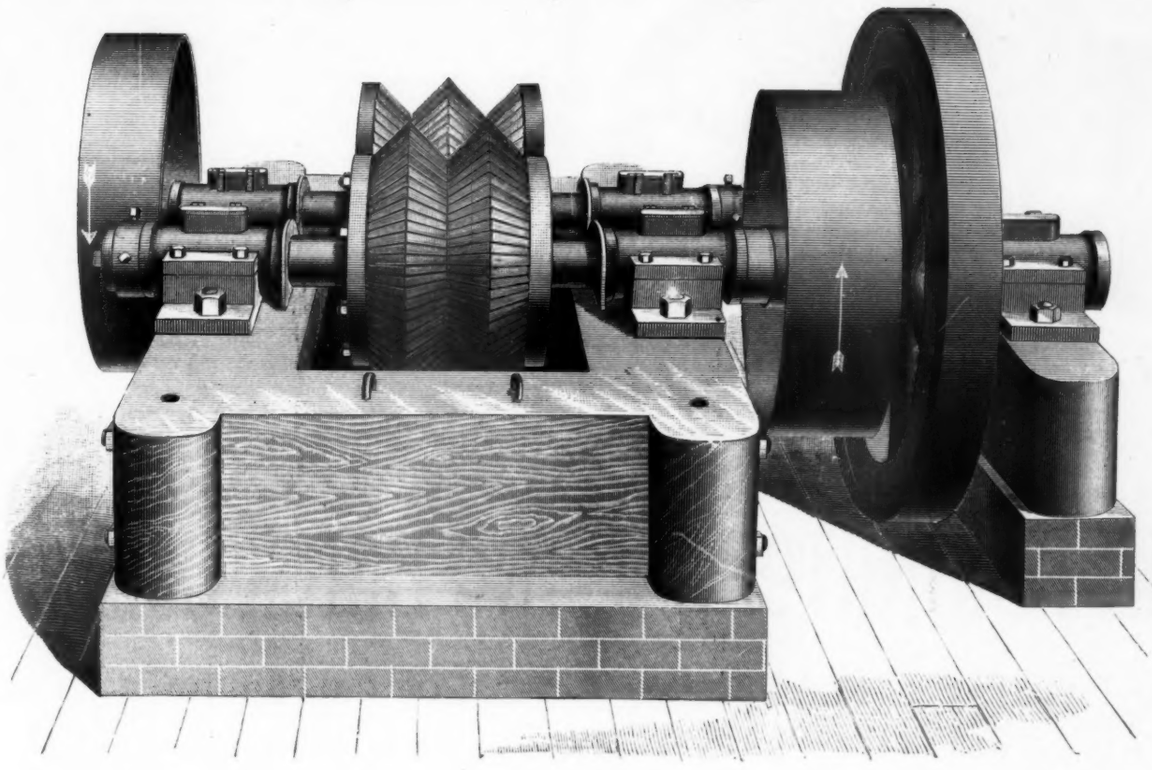

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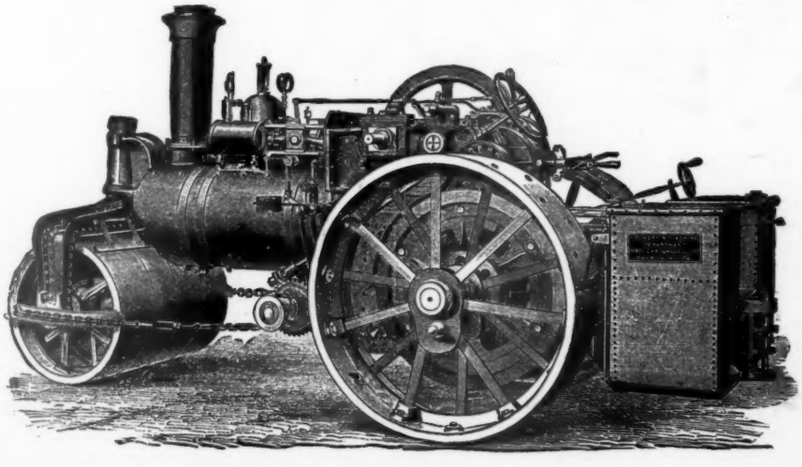

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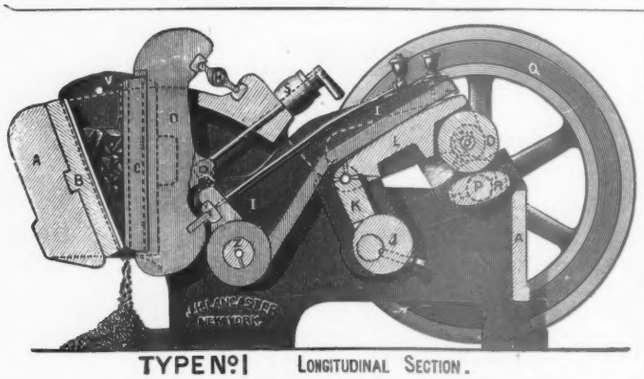

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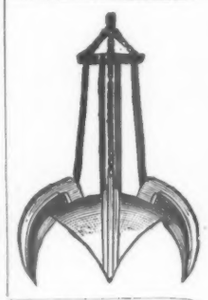

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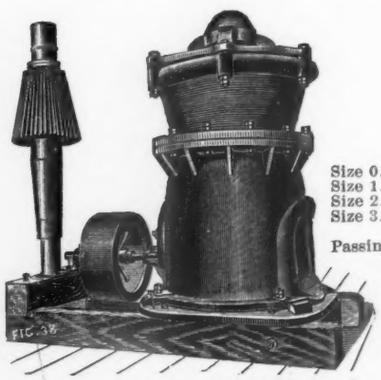

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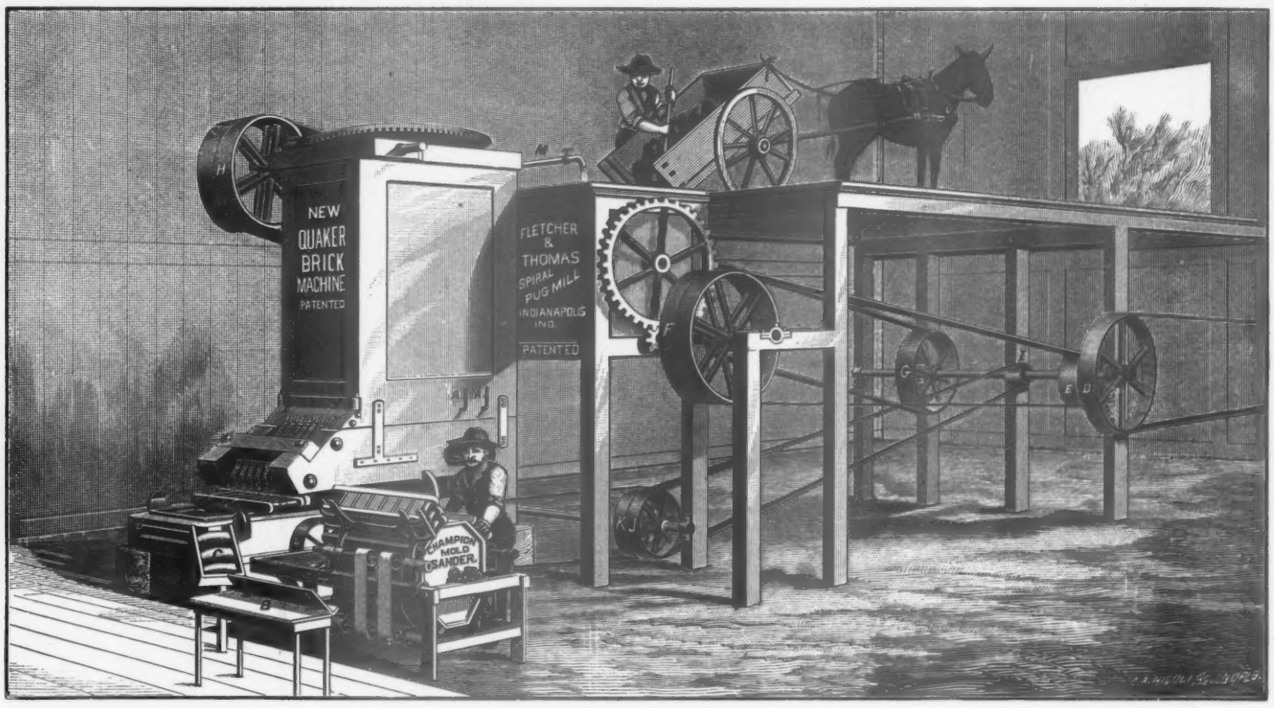

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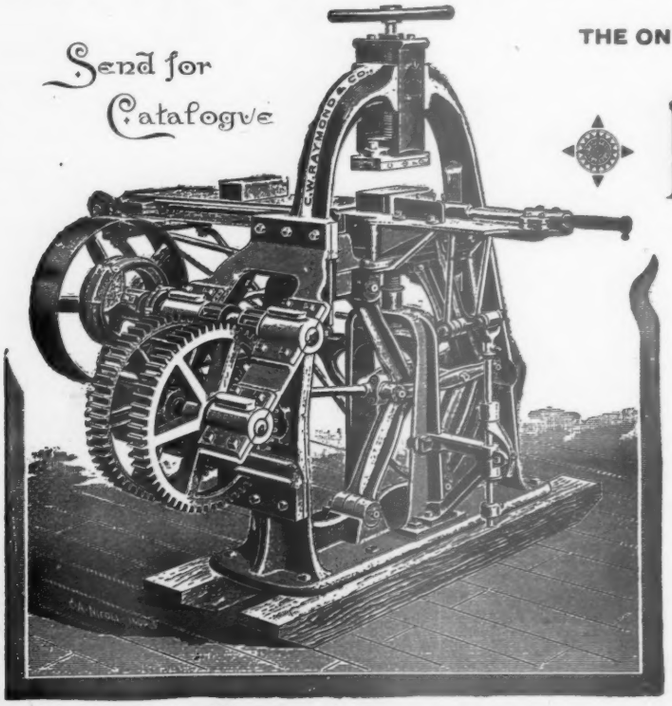

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